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FINAL
SOUTHEAST ROCKFORD
SOURCE CONTROL OPERABLE UNIT
WORK PLAN
FEBRUARY 1996

Prepared For:

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PROTECTION AGENCY
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1.0 INTRODUCTION

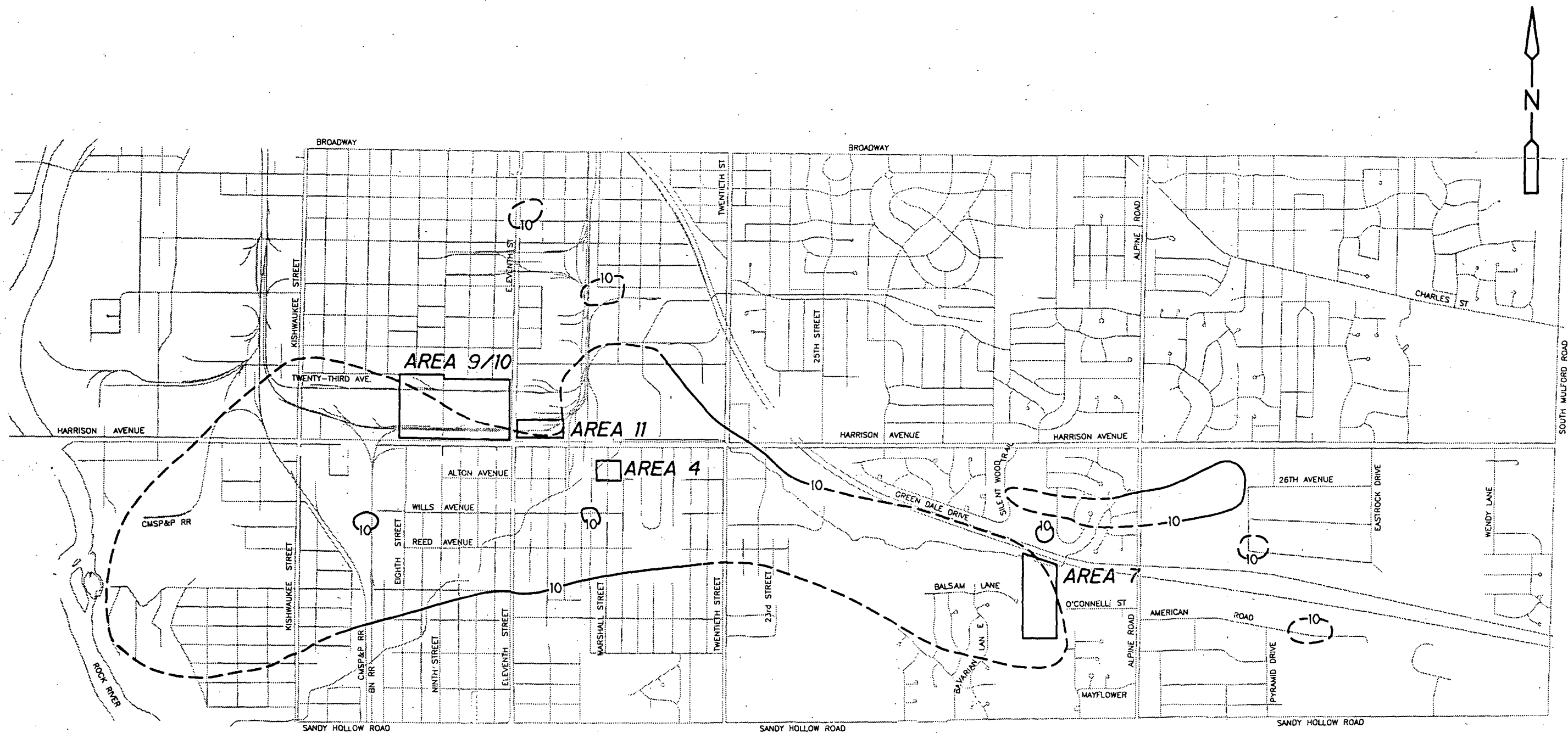
This workplan has been prepared to define the scope of activities required to perform the initial tasks for the Source Control Operable Unit (SCOU) at the Southeast Rockford Groundwater Contamination site in Rockford, Illinois. This portion of the SCOU will involve a source area investigation and preparation of a data interpretation Technical Memorandum. Initial sampling events in the study area by the Illinois Department of Public Health (IDPH), the USEPA Technical Assistance Team (USEPA TAT) and Illinois Environmental Protection Agency (IEPA) indicated that an east-west trending plume of volatile organic compound (VOC) contaminated groundwater extended from the vicinity of 8th Street and Wills Avenue to the vicinity of 23rd Street and Reed Avenue. Additionally, Rockford Water Utility (RWU) has experienced VOC contamination in several of its municipal wells since 1981. Municipal Unit Well 35 (UW35), which is located within the groundwater study area, was taken out of normal service in 1985 due to VOC contamination. The original site boundaries for the Southeast Rockford Groundwater Contamination site were proposed for inclusion on the National Priority List (NPL) in June 1988, and the site was added to the NPL in March 1989 as a state-lead, federally funded Superfund site.

From June to November of 1990, USEPA Emergency Response Section conducted a "removal action" which consisted of providing water main extensions and service connections to residences with private wells that equalled or exceeded 25 percent of the Removal Action Level for VOCs. Concurrent with this removal action, Camp Dresser & McKee Inc. (CDM), under the direction of IEPA, conducted the Operable Unit Remedial Investigation and Feasibility Study. This study consisted of sampling of 117 residential, commercial, and industrial wells for VOCs and metals, identifying areas where contaminant concentrations exceeded MCLs for VOCs and evaluating alternative water supply options for private well owners. As a result of this study, additional water main extensions and service connections were installed and a granular activated carbon treatment system was installed at UW35 so that it could be brought back into service to help ease the increased water demand.

From June to October of 1991, CDM and its subcontractors, under the direction of IEPA, conducted the Phase I Remedial Investigation. In Phase I the groundwater study area was expanded from the original NPL site boundaries to an area of approximately 5 square miles. The Phase I area was bounded on the north by Harrison Avenue, on the south by Sandy Hollow Road, Wendy Lane to the east, and the Rock River to the west (see Figure 1-1). Phase I activities included a 225-point soil gas survey, installation of 33 monitoring wells at 11 locations, hydraulic conductivity testing, groundwater sampling and analysis of the 33 Phase I wells, 19 Illinois State Water Survey (ISWS) wells and 16 industrial wells, and subsurface soil sampling during drilling. The Phase I study was designed to define the nature and distribution of groundwater contamination, define local geology and hydrogeology, and to gain preliminary information on potential contaminant source areas.

Phase II field activities conducted from January 1993 to January 1994, included a soil gas survey of twelve potential source areas, soil boring installation and sampling, monitoring well installation and sampling, residential well sampling, residential air sampling, and Source Area 7 test pit soil and ambient air sampling. During the Phase II field activities, 212 soil gas points were sampled, 44 monitoring wells were installed, 55 subsurface soil borings were drilled, 116 subsurface and 10 surface soil samples were collected, 165 groundwater samples were collected from monitoring wells, 24 groundwater samples were collected from residential wells, 20 residential air samples were collected, and two test pits were excavated in the study area. The Phase II study was designed to further define the extent of groundwater contamination within the Phase I groundwater study area, provide screening information on existing and newly identified source areas, and evaluate contaminant fate and transport.

The results of the Phase I and II groundwater investigations indicated several contaminant source areas that contribute to the groundwater contaminant plumes. The source areas of interest in the Source Control Operable Unit (SCOU) are shown in Figure 1-1. This operable unit is designed to provide the data necessary to support the evaluation of feasible remedial alternatives for source control. As a provision of the groundwater remedy, source control is proposed in order to meet ARARs within the time frames outlined in the groundwater Record of Decision (ROD). Residential hook-ups were also proposed in the groundwater ROD.



LEGEND:

- AREA 4 SOURCE AREAS TO BE STUDIED
- 10 — TOTAL HALOGENATED VOC CONTOUR (ug/L).
 DASHED WHERE INFERRED

SCALE:
 500 0 1000 Feet

This work plan provides a description of the study area in Section 2, the scope of work for the SCOU activities in Section 3, project staffing in Section 4, and project schedule and budget in Section 5.

2.0 SOURCE AREA DESCRIPTION

The area surrounding the source areas is predominantly urban and suburban residential, including scattered industrial, agricultural, retail and commercial operations. A small industrial park is located in the vicinity of Laude Drive and 22nd Street. Other industrial areas are located along Harrison Avenue from Alpine Road to the Rock River. Agricultural areas are present near Area 7.

The area surrounding the source areas is predominantly flat-lying and slopes gently westward towards the Rock River, but locally contains low-relief hilly areas. Maximum topographic relief from Area 7 to the Rock River is approximately 160 feet.

The stratigraphy beneath the source areas consists of bedrock with locally significant subsurface relief that is overlain by unconsolidated glacial sediments of variable thickness. The uppermost bedrock unit is generally dolomite, which forms a subsurface valley greater than 200 feet deep in the western part of the study area. Glacial sediments are thickest within this bedrock valley and thinnest on the valley flanks. The glacial sediments and the bedrock constitute two hydraulically-connected aquifers; no areally extensive aquitards have been identified between the unconsolidated deposits and the dolomite.

Four source areas will be investigated during the Source Control Operable Unit (SCOU) activities. Area 7 is primarily an undeveloped area whereas Areas 4, 9/10, and 11 are primarily industrial areas. CDM conducted background review for some of the industries located in Areas 4, 10 and 11. At this time little is known regarding activities in Area 9. The existing information on Areas 4, 7, 9/10, and 11 is summarized below.

Area 4

Swabco Manufacturing, Inc. at 2630 Marshall Street is a precision contract machining shop producing metal parts. This is the only industry located in Area 4. The present management acquired ownership in 1985 under the name of Pro-Tool Manufacturing Co. then changed to

Swebco Manufacturing, Inc. in 1990. The company did use a solvent, although its contents are not specified. However, naphthenic distillate petroleum, hydrocarbons, and mineral spirits are all components of compounds used at the facility. There are three underground tanks present, in unknown condition. They are currently thought to be empty, but their past contents were fuel oil and waste oil. The area around the tanks was sampled once, indicating benzene, toluene, ethylbenzene and xylene (BETX) contamination. When asked about past releases, Swebco described two spills of water-soluble coolant.

The Area 4 contaminant plume consists primarily of TCA and is relatively small compared with the other source area plumes. The high VOC concentrations detected exist near the top of the saturated zone. The maximum thickness of the suspected NAPL is at least eight feet. The VOC contaminant concentration ranges for Area 4 are provided in Table 2-1.

Area 7

Area 7 is primarily an undeveloped area that has a children's playground, tennis courts and basketball court. Some of the land has been planted with soy beans in the past. Previous work in Area 7 has identified contamination in the central, south and eastern portions of the area. Additional work will be conducted in the north, northwest, and southwest parts of the area. Historical aerial photographs indicate that wastes were likely disposed in Area 7 from 1958 to 1970. Recent information indicates that hazardous waste disposal probably occurred from the late 1950s to early 1960s.

The contamination plume in Area 7 consists of chlorinated VOCs (TCA, PCE, TCE, and 1,2-DCE) and aromatics (xylene, ethylbenzene and toluene). The range of VOC contaminant concentrations detected in Area 7 is provided on Table 2-1. The plume begins in Area 7 and gradually migrates from the shallow portion of the aquifer system to maximum depths of about 200 feet between MW103 and MW101.

Table 2-1
Range of VOC Contaminant Concentrations
In Areas 4, 7, 9/10 and 11

VOC Contaminant Concentration Ranges - Area 4		
Contaminant	Concentration Range in Soils (ppb)	Concentration in Groundwater (ppb)
Benzene	BDL-2J	BDL
1, 1-Dichloroethane	BDL	26J
1, 1-Dichloroethene	BDL	10J
1, 2-Dichloroethene (total)	BDL	25J
Chlorobenzene	BDL-2J	BDL
Tetrachloroethene	BDL-1J	BDL
Toluene	BDL-41	43J
1, 1, 1-Trichloroethane	BDL-360,000	1,000
Trichloroethene	BDL	28J
Xylene	BDL	28J

VOC Contaminant Concentration Ranges - Area 7		
Contaminant	Concentration Range in Soils (ppb)	Concentration Ranges in Groundwater (ppb)
1, 1-Dichloroethane	BDL-240J	BDL-220J
1, 1-Dichloroethene	BDL-11J	BDL-180J
Chloroform	BDL-2J	BDL-23
1, 2-Dichloroethane	BDL-180	BDL-13
1, 2-Dichloroethene (total)	BDL-49,000	BDL-5,900
Ethylbenzene	BDL-31,000	BDL-210
Tetrachloroethene	BDL-260,000	BDL-1,200
Toluene	BDL-23,000J	BDL-170
1, 1, 1-Trichloroethane	BDL-380,000	BDL-8,000
1, 1, 2-Trichloroethane	BDL-7J	BDL
Trichloroethene	BDL-130,000	BDL-650
Vinyl Chloride	BDL	BDL-75
Xylene	BDL-210,000	BDL-1,100

Contaminants included in these tables include chlorinated VOCs and the more common non-chlorinated VOCs. Semivolatiles have been found at both source areas, but were not found to have a significant impact on groundwater quality. These contaminants include low concentrations of naphthalene, methylnaphthalene, phthalates, polyaromatic hydrocarbons, PCBs and pesticides.

Notes: BDL - Below Detection Limits

J - Estimated Values

Table 2-1 (Continued)
Range of VOC Contaminant Concentrations
In Areas 4, 7, 9/10 and 11

VOC Contaminant Concentrations - Area 9/10		
Contaminant	Concentration Range in Soils (ppb)	Concentration Ranges in Groundwater (ppb)
Chloroethane	N/A	BDL-500
1, 1-Dichloroethane	N/A	BDL-2,100
1, 1-Dichloroethene	N/A	BDL-410
1, 2-Dichloroethane	N/A	BDL-6J
1, 2-Dichloroethene (total)	N/A	BDL-210
Ethylbenzene	N/A	BDL-19
Tetrachloroethene	N/A	BDL-50J
Toluene	N/A	BDL-420
1, 1, 1-Trichloroethane	N/A	BDL-1,400
1, 1, 2-Trichloroethane	N/A	BDL-60J
Trichloroethene	N/A	BDL-140
Vinyl Chloride	N/A	BDL-14
Xylene	N/A	BDL-77

VOC Contaminant Concentrations - Near Area 11		
Contaminant	Concentration Range in Soils (ppb)	Concentration Ranges in Groundwater (ppb)
Benzene	BDL-1,500	BDL-23J
Ethylbenzene	BDL-590,000	BDL-2,000J
Tetrachloroethene	BDL-46	BDL
1, 1, 1-Trichloroethane	BDL-3J	BDL-860
Trichloroethene	BDL	BDL-170J
Toluene	BDL-1,400,000	BDL-310,000
Xylene	BDL-2,300,000	BDL-9,500

Since soil samples were not previously collected in Area 9/10, contaminant ranges in soils were not available. Source data for Area 11 is incomplete. Area 9/10 and Area 11 will be fully characterized in operable unit 3 (source control).

Notes: BDL - Below Detection Limits
 J - Estimated Values
 N/A - Not Available

Area 9/10

Area 9/10 contains numerous industries, several of which are no longer active. Sundstrand's Plant 1, located at 2421 11th Street, in an active facility that manufactures aircraft parts for constant speed drives. Nylint leases a warehouse located south of Sundstrand for the storage of steel and plastic toys. Stephen Paoli Manufacturing, located at Eleventh and Harrison currently manufactures food processing equipment. The Rockford Products and Fastners facility located on 9th Street west of Nylint is active.

To the west of Paoli, along Harrison Avenue are several inactive facilities including the former Rohrbacher Manufacturing, Libby Oil and Chemical and Nu-Clo. An additional inactive facility is located at 2401 11th Street, Mid-States Industrial, which manufactured various tools, pipes and valves.

There are several parking lots within the 9/10 area and a few commercial establishments. There is a new warehouse facility for J.L. Clark located along Twenty-Third Avenue that is nearing completion. To the north of Twenty-Third Avenue is a residential area.

The Area 9/10 contaminant plume consists mostly of chlorinated VOCs; the aromatics ethylbenzene, toluene and xylene also present. Detected VOC contaminant concentration ranges in Area 9/10 are listed on Table 2-1.

Area 11

Rockford Coatings Corporation, located in Area 11, discontinued operations at 1620 Harrison Avenue in 1983. The company manufactured different paint products, including air-dry and baking enamels, lacquers, and water-based paints. Use of chlorinated solvents at the facility is unknown. Waste from the facility was handled by Acme Solvents in the early 1980s.

Rockwell International Graphics at 2524 11th Street manufactured gears and rollers for newspaper presses until approximately 1991. The facility used 1,1,1-trichloroethane for cleaning rollers until 1983. The property is now owned by P.H. Partners Co., which leases it to Rohr

Manufacturing. According to P.H. Partners Co., the property was leased to Sundstrand during the Korean War. P.H. Partners initially denied access for Phase II investigative work on their property during the groundwater RI/FS. A railroad right-of-way is located adjacent to the property, to the south. This land is owned by Aetna Plywood. There was an environmental assessment performed on the property ("*Environmental Assessment, Former Railroad Right-of-Way*," by Dames & Moore, 1990), which indicated some areas of concern. The work and sampling results outlined below are from this assessment. One such area was a section of stained soil adjacent to a concrete slab on the P.H. Partners property. It appeared that a Rockwell Graphics dumpster had leaked cutting oils onto the ground surface. A grab sample of soil indicated 15,900 ppm total petroleum hydrocarbons (TPH). TCE was detected in this area at 21.3 ppb. A monitoring well (MW-3) placed in this area indicated 2.5 ppb PCE, 36.6 ppb TCA, and 7.4 ppb TCE. Also, a pit to the north of the former Rockwell Graphics property contained standing water with an oily sheen; a soil sample adjacent to this pit contained 460 ppm TPH. Other areas of concern in the right-of-way south of the former Rockwell Graphics property are a bunker, reportedly used by Rockford Varnish Company (formerly at 11th Street and Harrison Avenue), that was seeping a tar-like substance. A monitoring well (MW-2) in this area indicated 1,150 ppb TCA and 302 ppb TCE. A second area was the portion of the right-of-way near the above-ground tanks, located just south of the right-of-way. A monitoring well (MW-1) in the right-of-way and near these tanks did not indicate contamination from chlorinated solvents, but did show a concentration of toluene at 604 ppm.

The Area 11 contaminant plume consists primarily of aromatics (xylene, toluene and ethylbenzene), though elevated concentrations (up to 2,900 ppb) of several chlorinated VOCs are also present. There appears to be two separate NAPLs in Area 11, the larger NAPL has a thickness of generally 5 to 10 feet and locally as great as 25 feet. VOC contaminant ranges in Area 11 are listed in Table 2-1.

3.0 SCOPE OF WORK

3.1 OBJECTIVES OF SOURCE CONTROL OPERABLE UNIT

The Phase I and II Remedial Investigations, both conducted by Camp Dresser & McKee Inc. (CDM) under the direction of the Illinois Environmental Protection Agency (IEPA), have identified several source areas of volatile organic compound (VOC) contamination in southeast Rockford, Illinois. The source areas of interest are Areas 4, 7, 9/10, and 11. These areas either contain or are likely to contain significant concentrations of VOCs that contribute to groundwater contaminant plumes delineated during the Phase I and II investigations. The field investigation is designed to delineate the horizontal and vertical extent of contaminant sources, including any NAPLs that may be encountered. The primary objective of the Southeast Rockford Source Control Operable Unit (SCOU) study is to provide detailed information to support source remediation. Source remediation is included as a component to the selected groundwater response action outlined in the groundwater ROD. The groundwater study is referred to as Operable Unit 2 in the ROD document. In addition, some long term objectives of the SCOU include establishing soil cleanup objectives using chemical and physical data, and performing a focused feasibility study to identify and evaluate options by which final remedial action objectives can be met. These long range tasks are not included in this workplan. The preliminary tasks for meeting the SCOU data gathering objectives are described in the sections below.

3.2 QUALITY ASSURANCE PROJECT PLAN ADDENDUM

An addendum to the Quality Assurance Project Plan (QAPP) will be prepared to document all aspects of quality control and quality assurance for the project. Sampling quality control measures (including documentation, sampling matrix, frequency, and standard materials) will be specifically identified. Laboratory quality control for all aspects of analyses will be included as well as equipment maintenance requirements. Data quality objectives will be specified for accuracy, precision, completeness, and representativeness for each analytical parameter. Project quality assurance and field and system audits will be discussed as well as data validation, documentation, and reporting.

The Sampling and Analysis Plan (SAP) will be an appendix to the QAPP addendum and will include a detailed description of all sampling and analyses to be performed during the SCOU. Included will be procedures for field collection of samples, shipment of samples, documentation, quality control, and chain-of-custody. Sampling location rationale will be described and figures and descriptions of locations will be documented in the plan. The SAP will be designed to provide stand alone guidance for the field personnel conducting the field activities. The plans will be submitted to IEPA and USEPA for review and approval.

3.3 HEALTH AND SAFETY PLAN

The health and safety plan (HASP) will describe health and safety procedures for SCOU activities. This HASP will describe applicable provisions for the most recent revisions of the following regulations and guidelines:

- OSHA Safety and Health Standards 29 CFR 1910 (General Industry), US Department of Labor, Occupational Safety and Health Administration, especially OSHA 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response;
- OSHA Safety and Health Standards 29 CFR 1926 (Construction Industry), US Department of Labor, Occupational Safety and Health Administration;
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, US Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; and
- Standard Operating Safety Guides, US Environmental Protection Agency (EPA), Office of Emergency and Remedial Response PB92-983414 (1992).

This plan will be submitted to IEPA for review.

3.4 SUBCONTRACTOR PROCUREMENT

Subcontractors will be used for the drilling, soil sampling, and soil gas surveying tasks as described in this work plan. Subcontractors will be selected based upon their qualification to perform the work required, the availability of adequate equipment, cost, ability to meet health and safety requirements, ability to meet the project schedule, and other appropriate criteria which are pertinent to selection of a subcontractor.

3.5 SITE MOBILIZATION

Prior to the start of field activities, CDM will mobilize to the site. This activity includes setting up site trailer and associated utilities, procuring the necessary equipment and supplies, and coordinating with the subcontractors. In the project budget, the cost for most of the field equipment, trailer, utilities and supplies has been included under the mobilization task for ease of review. The costs for personal protective gear and specialized equipment has been included under the specific tasks where they will be used. The project budget for the field activities is based on the assumption that field work will take 2 months and IEPA will supply organic vapor meters, calibration equipment and all sample bottles.

3.6 SOURCE AREA INVESTIGATION

An investigation of Source Areas 4, 7, 9/10, and 11 (see Figure 3-1) will be conducted during the SCOU to further define the extent of contamination in the vadose zone and to evaluate whether dense non-aqueous phase liquid (DNAPL) is present. The field investigation activities to be performed are described in the following subsections. Additional data may be needed to develop site specific remediation goals. These data may include parameters such as hydraulic gradient, hydraulic conductivity, estimate of infiltration, contaminant source length, and mixing zone depth. This additional data may also be used for input to future treatability studies.

3.6.1 SOIL GAS SURVEY

A soil gas survey of VOCs will be conducted in Areas 4, 7, 9/10, and 11 prior to soil sampling. These areas were identified from Phase I and II data, aerial photographs, site visits, and information regarding industrial activities. The rationale for each SCOU soil gas survey area is given in Table 3-1 and the locations of the soil gas areas are shown in Figure 3-1.

The proposed soil gas sample locations are shown in Figures 3-2 through 3-5. A total of 298 (including contingency sampling locations) soil gas sample locations have been identified.

Analytes of interest in each area include:

1,1,1-TCA	PCE
1,1-DCA	TCE
	1,2-DCE
	Vinyl Chloride

In addition, in Areas 9/10 and 11 the following compounds will also be quantified:

- Benzene
- Ethylbenzene
- Toluene
- Xylenes

Soil gas concentrations will be used to define contaminated areas in or near the sources. Soil gas points will be spaced 50 to 100 feet apart in a rectilinear grid pattern where possible. Deviations from this pattern may be necessary to avoid underground utilities or above ground obstacles. A Geoprobe unit will be used to collect soil gas samples. The depth of sample collection will vary with the depth to groundwater. It is anticipated that soil gas samples will be collected at depths between 5 and 30 feet. Soil gas samples will be analyzed shortly after collection using a gas chromatograph located at the site. Results of the soil gas survey will be used to locate Geoprobe soil samples and deep soil borings.

<p align="center">TABLE 3-1</p> <p align="center">RATIONALE FOR SOIL GAS AND SOIL BORING WORK FOR SOURCE CONTROL OPERABLE UNIT SOUTHEAST ROCKFORD</p>				
Location	Soil Gas Survey Area	Proposed Soil Gas Survey Points	Proposed Soil Borings (Approximate)	Rationale
Adjacent to Marshall Street and Alton Avenue	4	38*	2	Close off the northeast, east, and south portions of the area.
East end of Balsam Lane	7	27**	2	Close off the northern boundary and southwest corner of the area.
Adjacent to 9th Street between Twenty-third and Harrison Avenues	9/10	176***	6	Augment existing soil gas data.
Northeast of 11th Street and Harrison Avenue	11	57****	3	Augment existing soil gas data.

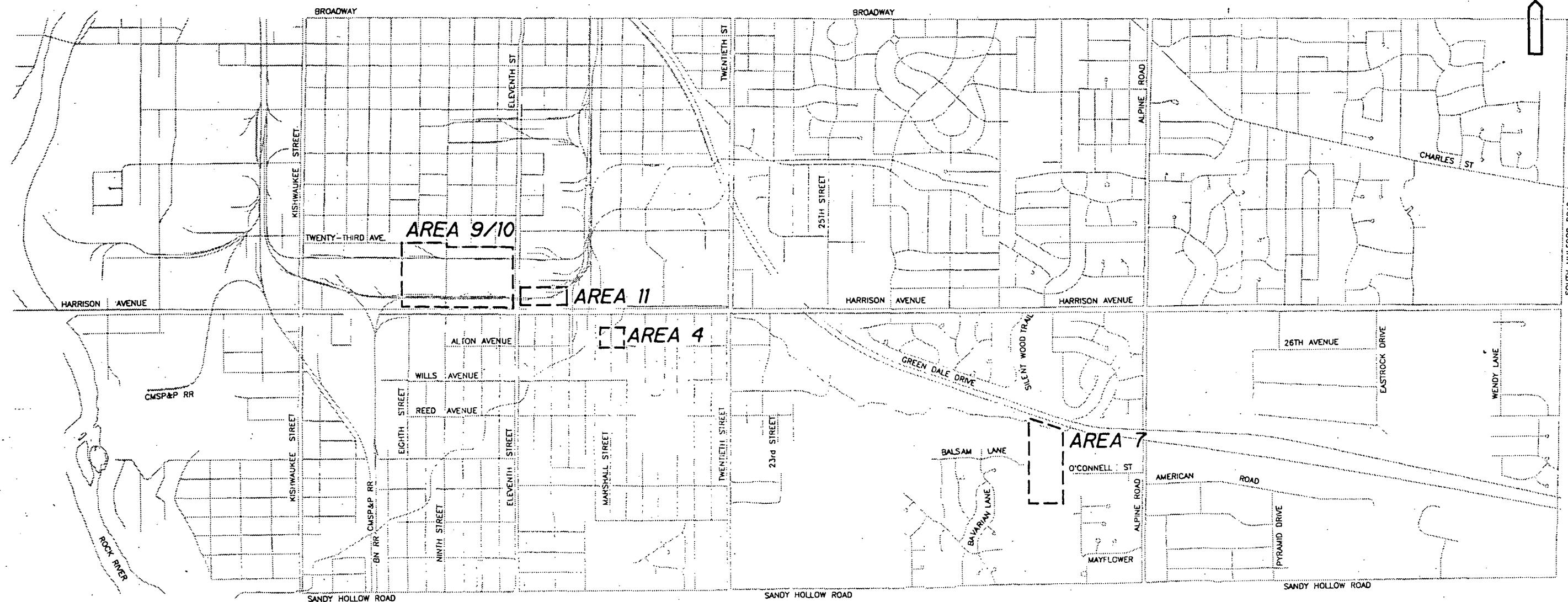
* Includes 6 contingency points

** Includes 4 contingency points

*** Includes 30 contingency points

**** Includes 10 contingency points


Figure 4-1



LEGEND:

AREA 4  SOURCE AREA

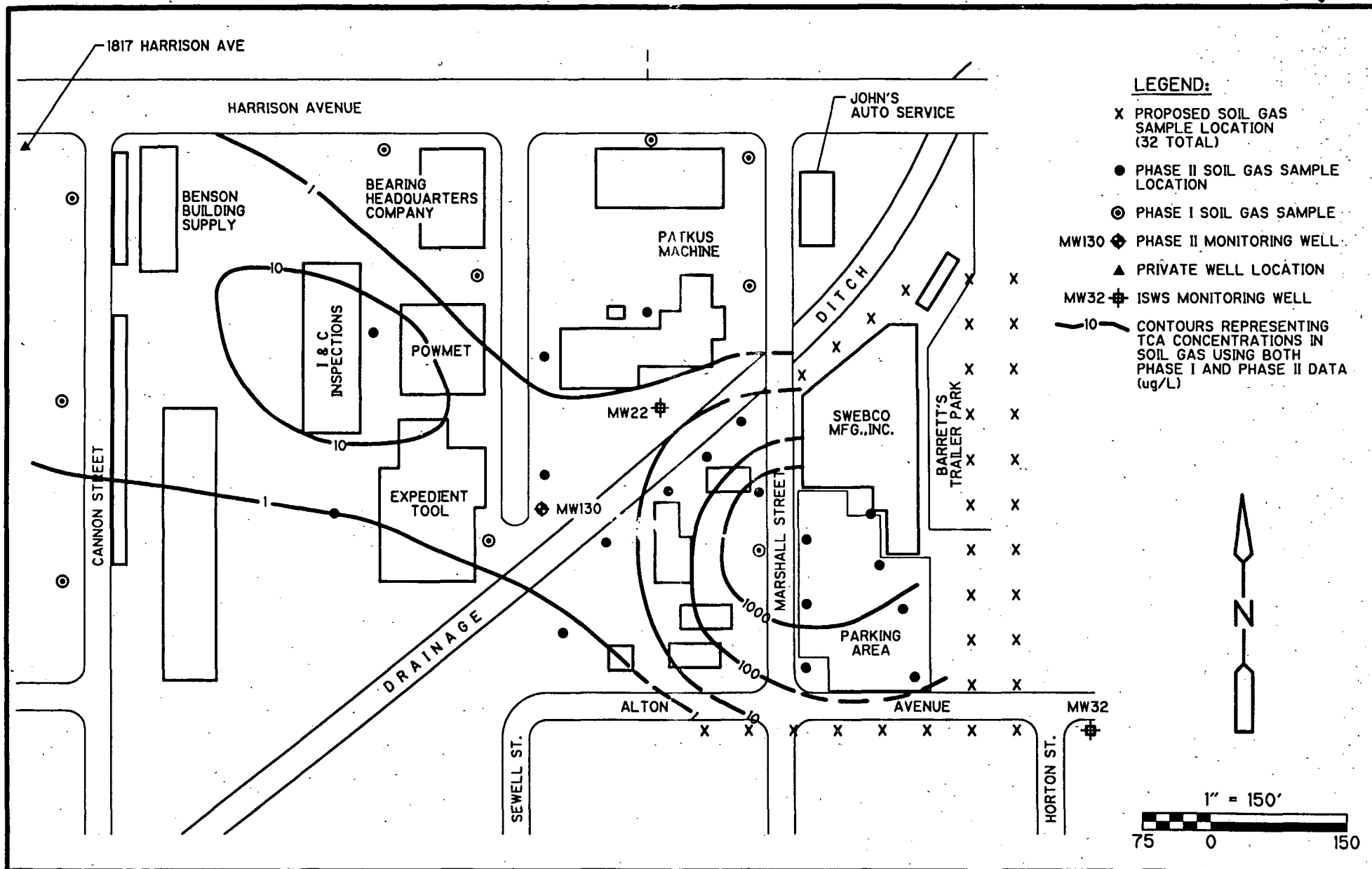
SCALE:

 500 0 1000 FeetSOUTHEAST ROCKFORD
SOURCE CONTROL OPERABLE UNIT

SOURCE AREA LOCATIONS

Figure No. 3-1

CDMenvironmental engineers, scientists,
planners, & management consultants



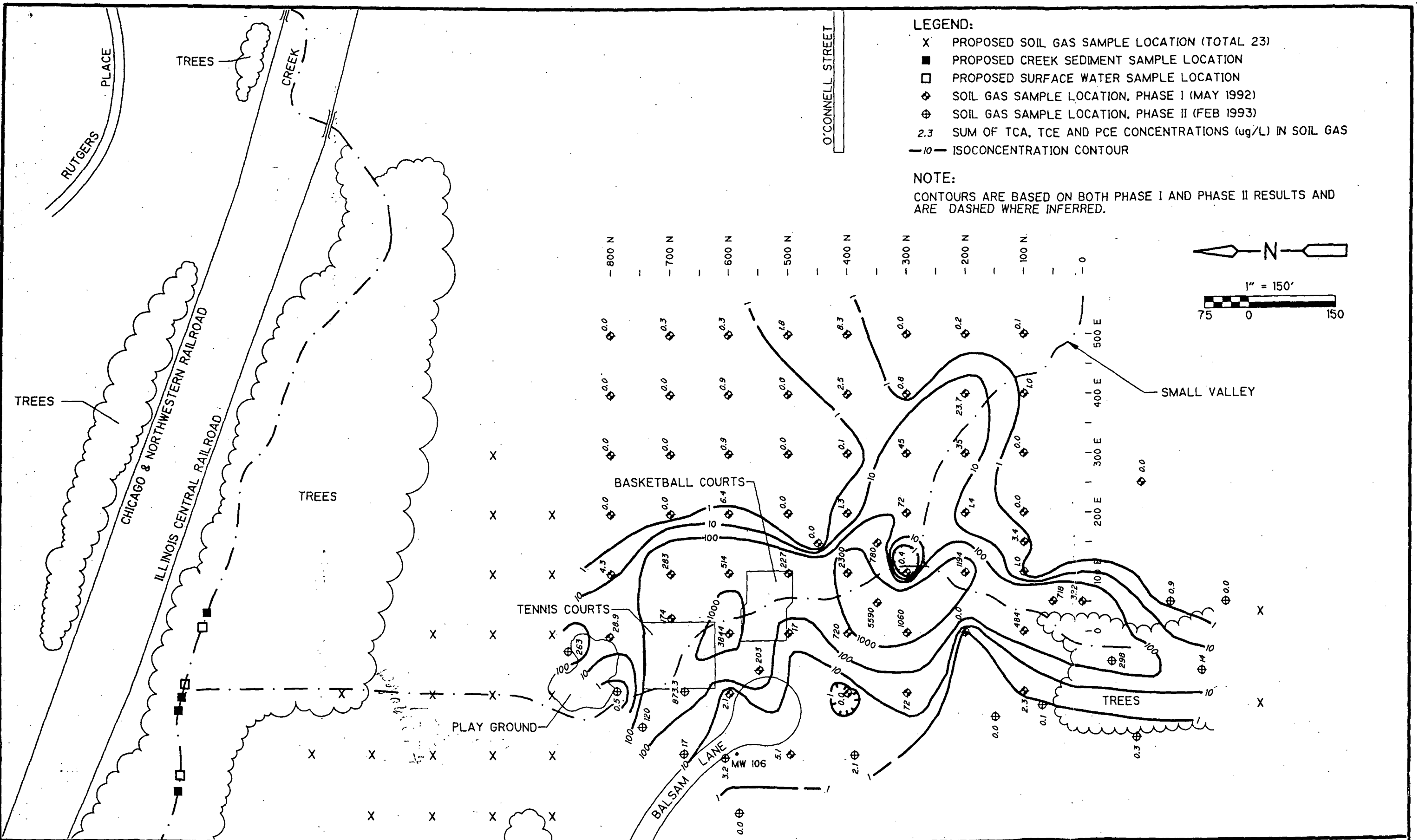
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT

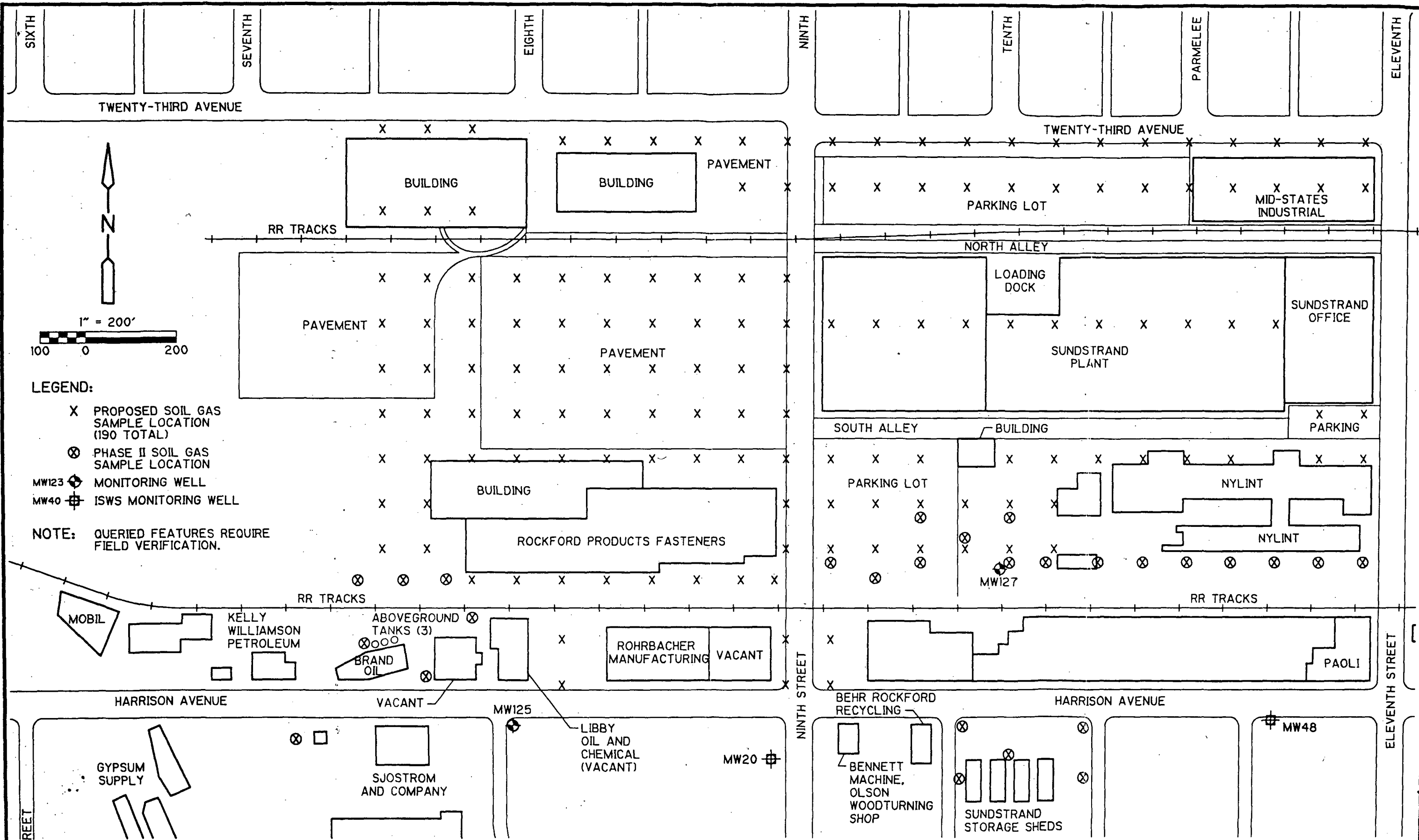
AREA 4 SOIL GAS SAMPLE LOCATIONS

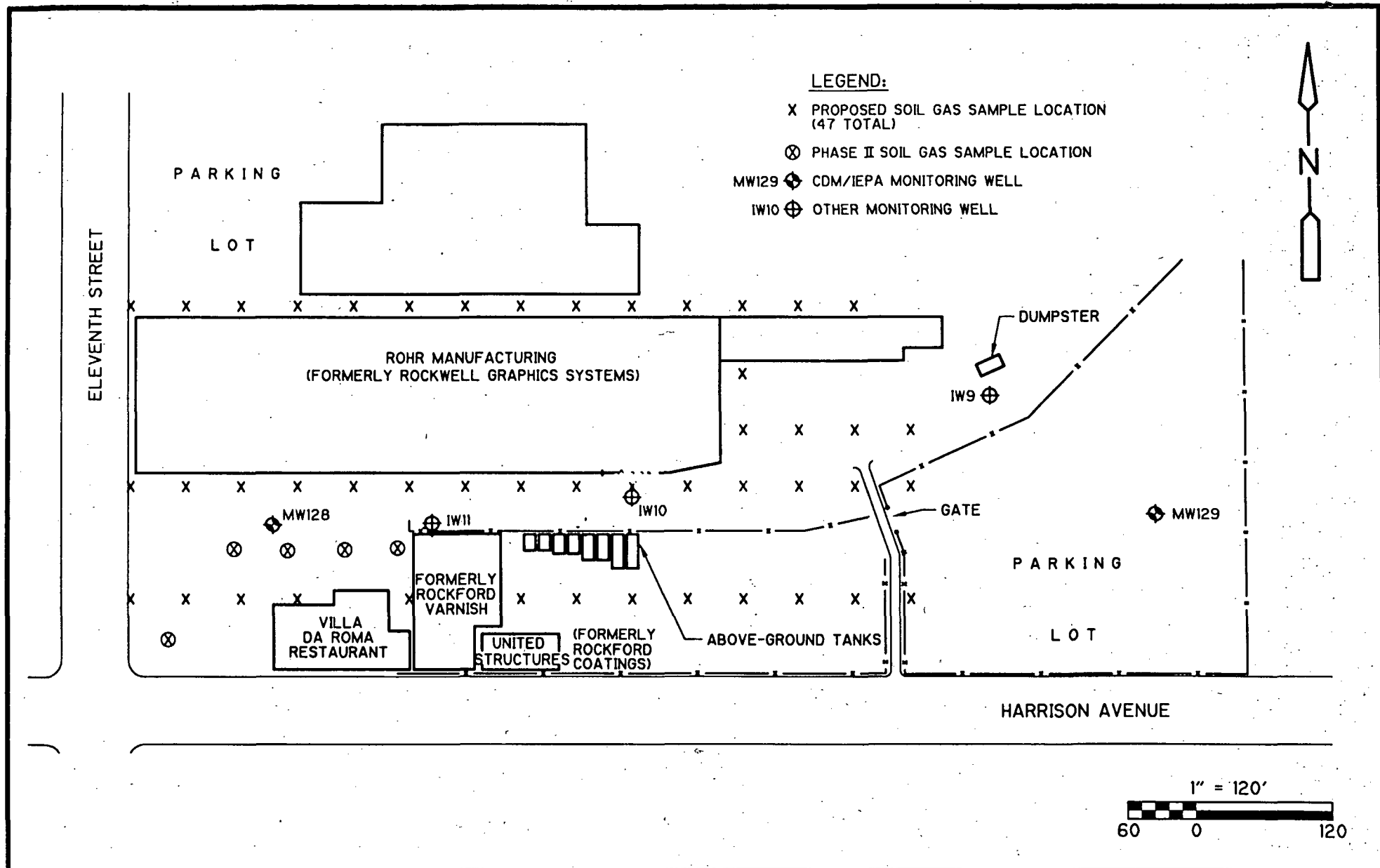
CDMenvironmental engineers, scientists,
planners, & management consultants

Figure No. 3-2

M. KUZEL, NMW-CHI 9.57.48 10/27/95 13:28:18 FIG 3-3 K:\168\14\SOURCE







SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT

AREA 11 SOIL GAS SAMPLE LOCATIONS

CDMenvironmental engineers, scientists,
planners, & management consultants

Figure No. 3-5

It is important to note that property access, particularly in Area 9/10, is critical to the success of the SCOU field investigation. CDM assumes that the agencies will obtain access for all properties shown in Figures 3-2 through 3-5 in a timely manner. Lack of access will hamper the field effort and likely result in an incomplete characterization of the investigated areas.

Area 4

The SCOU soil gas sample locations for Area 4 were chosen to close off the areas to the north, east, and south of the Swebco facility (Figure 3-2). A contingency of six locations was used for cost development.

Area 7

The SCOU soil gas sample locations for Area 7 (Figure 3-3) were chosen to close off the areas to the north and southwest of the area investigated during Phases I and II of the Remedial Investigation. Accordingly, the previous soil gas sampling grid was extended to achieve this objective. A contingency of four locations was used for cost development.

Area 9/10

The SCOU soil gas sample locations for Area 9/10 were chosen to augment soil gas results from the Phase II investigation which found low to moderate concentrations of VOCs at the locations shown in Figure 3-4. Area 9/10 is the least characterized of the four source areas addressed in this SCOU, and it represents a composite of two formerly separate areas from the Phase II investigation. The former Area 9 is located west of 9th Street and the former Area 10 is located east of 9th Street.

Although a total of 146 proposed sample locations are shown in Figure 3-4, the actual number and position of the samples will depend on access and field conditions. The current map is based primarily on a recent aerial photograph (1988) in which it is difficult to distinguish consistently buildings from paved areas. Hence, the accuracy of some of the features shown in Figure 3-4 are queried pending field verification. For the purpose of cost development, it was assumed that queried areas consist of pavement only and that samples will be collected from areas containing both buildings and pavement. A contingency of 30 locations was used for cost development.

Area 11

The SCOU soil gas sample locations for Area 11 (Figure 3-5) were chosen to augment soil gas results from the Phase II investigation which found low concentrations of VOCs in the southwest corner. The low VOC concentrations detected during the Phase II soil gas survey likely resulted from masking effects produced by high concentrations of benzene, ethylbenzene, toluene, and xylenes (BETX). Both VOCs and BETX compounds will be quantified during the SCOU soil gas survey. A contingency of 10 locations was used for cost development

3.6.2 GEOPROBE SOIL SAMPLES

Soil samples will be collected with a Geoprobe unit from 25 percent of the soil gas sampling locations to confirm the soil gas results and to help delineate the extent of soil contamination. Samples will be analyzed by the USEPA Contract Laboratory Program (CLP) for volatile organics in Areas 4, 7 and 11 and for volatile and semi-volatile organics in Area 9/10. Area 9/10 has no previous subsurface data available.

Sample locations will be selected to confirm hot spots and to better define areas where soil gas concentrations begin to decrease. Two soil samples from the vadose zone will be collected at each location and sent to the CLP for analysis. The first soil sample will be taken from the interval exhibiting large soil gas concentration, and the second sample will be collected at greater depth than the first where field headspace screening indicates little or no organic vapors. A PID or FID will be used for field screening measurements.

3.6.3 SOIL BORINGS

Soil borings will be drilled in Areas 4, 7, 9/10, and 11 in areas where soil gas and for field headspace measurements indicate high VOC concentrations. The primary objectives of the deep soil borings are to determine whether DNAPL is present near the zones of highest contamination, and to provide detailed information about the stratigraphy. The borings will be sampled continuously with a split-barrel sampler and advanced until either a contaminated clay unit or bedrock is encountered. Drilling will be conducted using either

hollow stem augers or mud rotary, depending on the site conditions. In Area 7, bedrock is expected to be approximately 80 feet below grade; bedrock is expected to be more than 100 feet deep in Areas 4, 9/10, and 11. Two borings will be drilled in Areas 4 and 7, three borings in 11, and six borings in Area 9/10 because relatively little is known about the subsurface conditions in this area. Boring depth is expected to be 80 feet in each area except in Area 11, where a 60 foot depth (approximately 30 feet below the water table) is anticipated because of the predominance of compounds that are less dense than water. If field screening indicates contamination at a depth of 60 feet at boring locations in Area 11 or at depths of 80 feet in Areas 4, 7 and 9/10, the borehole will be advanced to bedrock expected to be at a maximum depth of 120 feet.

Soil samples will be visually examined, screened for organic vapors with a PID or FID, and select samples will be physically tested to detect NAPL. The procedure for the visual detection of NAPL in soil is described in the Sampling and Analysis Plan (SAP). In addition, one soil sample from each boring in Areas 4, 7, and 11 ~~will be sent to a CEF laboratory for chemical analysis of volatile organics.~~ In Area 9/10, two soil samples from each boring will be submitted for analysis of ~~RAS Volatile Organics and RAS Metals and Cyanide~~ due to the lack of existing data. Samples selected will be those also selected for field NAPL testing or an interval with relatively high organic vapor readings. The sampling and analysis program and sampling rationale is provided in the SAP.

3.6.4 RESIDENTIAL AIR SAMPLING

Residential air sampling will be conducted by the Illinois Department of Public Health (IDPH) in selected homes near Area 4 based on the results of the soil gas sampling. CDM will review the data generated and incorporate the results as appropriate in the Technical Memorandum.

3.7 AREA 7 SURFACE WATER AND CREEK SEDIMENT SAMPLING

Surface water and sediment from the creek that runs along the northern boundary of Area 7 will be sampled to characterize this portion of the site. One water sample will be collected at

sediment samples will be collected at the confluence point, and one sample each from upstream and downstream of this point. The surface water and sediment samples from the creek will be sent to a CLP laboratory for analysis of volatile organic compounds, semi-volatile organic compounds, and pesticides/PCBs.

3.8 SURFACE SOIL SAMPLING

A maximum of twenty surface soil samples will be collected during the SCOU. Locations will be determined in the field based on the results of the soil gas sampling. Residential and park areas will be the primary areas targeted for sampling. It is expected that four samples will be collected in Area 7, north of the playground and south of the creek; four samples will be collected in Area 9/10 in the residential area north of Twenty-Third Avenue and two samples from Area 4, east of the Swebco facility. No samples are currently proposed for Area 11. Samples will be analyzed for full RAS Target Compound List Organics and RAS Metals and Cyanide.

3.9 STORAGE AND DISPOSAL OF SCOU-GENERATED WASTES

The drilling and sampling activities for the SCOU investigation are expected to generate liquid and solid wastes. Solid wastes, including cuttings, personal protective equipment, and other incidental materials will be sealed in 55-gallon drums and placed in a central, secure drum storage area. IEPA will be responsible for selecting the location of an securing access for the drum storage area as well as for ensuring that the area is secured prior to drum removal.

CDM's drilling subcontractor will be responsible for the proper sampling and disposal of the drums on a regular basis. CDM will provide oversight during drum removal and IEPA will be responsible for all manifesting of the drums.

3.10 DECONTAMINATION PROCEDURE

Decontamination procedures for personnel are fully described in the Health and Safety Plan. Equipment decontamination procedures are briefly summarized in this section.

3.10 DECONTAMINATION PROCEDURE

Decontamination procedures for personnel are fully described in the Health and Safety Plan. Equipment decontamination procedures are briefly summarized in this section.

Decontamination of large equipment (drill rigs and associated equipment) will be performed at a decontamination pad lined with impermeable sheeting which drains to a shallow sump. Decontamination will consist of high-pressure steam cleaning and scrubbing, as necessary. Decontaminated drilling equipment (i. e., augers, rods) will be stored on plastic sheeting and kept from coming in contact with the ground surface and other potentially contaminated materials.

Sampling equipment, including split-spoon samplers, reusable spatulas, and other implements which may come in contact with the samples will be decontaminated by scrubbing with a dilute trisodium phosphate solution, followed by a tap water rinse, and a final deionized water rinse. Decontaminated sampling equipment will be placed on or wrapped in clean aluminum foil prior to next use. All field equipment will be thoroughly decontaminated prior to initiation of and at completion of SCOU field activities.

3.11 TECHNICAL MEMORANDUM

Following the receipt of analytical data, CDM will prepare a Draft Data Interpretation Technical Memorandum for the Source Control Operable Unit that will be used as a basis for an RI report to be produced later. This document will be for Agency use only and shall not be made available for public distribution. The report will present the data in tabular and graphic format; discuss source area characteristics such as vertical and horizontal extent, waste characteristics, and potential DNAPL; and present conclusions based on the data collected. Site maps will be generated showing sample locations, containment concentrations and estimates of source area dimensions. The general format for the report is shown in Table 3-2. The budget for this task assumes one draft will be prepared.

TABLE 3-2

REPORT FORMAT FOR THE TECHNICAL MEMORANDUM

EXECUTIVE SUMMARY

1.0 STUDY AREA INVESTIGATION

Brief description of field activities associated with site characterization

2.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

2.1 Includes results of field activities to determine physical characteristics

2.1.1 Geology

2.1.2 Soils

2.1.3 Surface Water and Sediment

3.0 NATURE AND EXTENT OF CONTAMINATION

3.1 Presents the results of site characterization, including both natural chemical components and contaminants in the following media:

3.1.1 Soils and Vadose Zone

3.1.2 Air

3.1.3 Surface Water and Sediments

4.0 CONCLUSIONS

3.12 CDM QUALITY ASSURANCE/QUALITY CONTROL MANAGEMENT

An onsite Field Manager (FM) will be responsible for overseeing the completion of Operable Unit (OU) field activities in a timely and quality manner. The FM will review the daily work assignments of project team members and will interject technical and managerial guidance as needed to increase the quality and minimize the cost of the work products. The FM is also responsible for satisfying the specific requirements of the QAPP during OU activities. The FM will report directly to the Project Manager (PM).

The Project Manager will coordinate with the Quality Assurance Manager (QAM) for the review of the Technical Memorandum. A Technical Review Committee (TRC), made up of experts in the areas of risk assessment, hydrogeology, contaminant transport and remediation, will work with the PM and QAM to the document for technical and management accuracy and completeness before it is released to the IEPA.

3.13 PROJECT MANAGEMENT AND ADMINISTRATION

It is CDM's corporate policy to assign a Client Officer to all projects regardless of size, type or complexity of the assignment. The Client Officer is a senior level manager whose responsibility is to achieve successful completion of the project as well as client satisfaction. While the Project Manager, who will report to the Client Officer, executes the day-to-day management and administrative functions, the Client Officer will be actively involved in the processing and making of all strategic project decisions. In support of the Project Manager, the Client Officer will ensure that the firm's technical specialists and general resources are made available for the project.

Responsibilities of the CDM Project Manager throughout the SCOU will include the following:

- Coordinate with the IEPA and USEPA to plan the scoping and scheduling of the SCOU:

- Selecting, coordinating and scheduling staff for task assignments;
- Manage the timely completion of all scheduled activities;
- Controlling budgets;
- Update IEPA and USEPA on all project schedules;
- Attend project review meetings and other meetings necessary for the normal progress of work;
- Monitoring Subcontractors;
- Maintain project quality assurance and quality control;
- Prepare monthly progress reports of technical, schedule and cost status; and
- Evaluate documentation and graphics for compliance with IEPA and USEPA standards.

The CDM Project Manager will prepare monthly progress reports for submission to the IEPA Project Manager, for the duration of project activities. Courtesy copies of these reports will also be copied to the USEPA Remedial Project Manager. These reports will describe the technical progress of the project and will discuss the following items:

- Description of site activity;
- Status of work at the site;
- Percentage of completion and schedule status;
- Problems encountered during the reporting period;

- Actions taken to rectify problems;
- Activities planned for the following month;
- Changes in personnel; and
- Project cost status.

Monthly progress reports will list target and actual completion dates for each task activity, including project completion, and will explain any deviations which have occurred or are anticipated.

3.14 SAMPLE MANAGEMENT

CDM will work with USEPA Region V Regional Sample Control Coordinator (RSCC) to schedule samples for the CLP, access the appropriate sample paperwork and chain of custody documentation and track samples through CLP analysis and validation by USEPA. CDM will enter the validated CLP data into the database already in place for the project. This database will be used to manipulate the data for interpretation and report preparation.

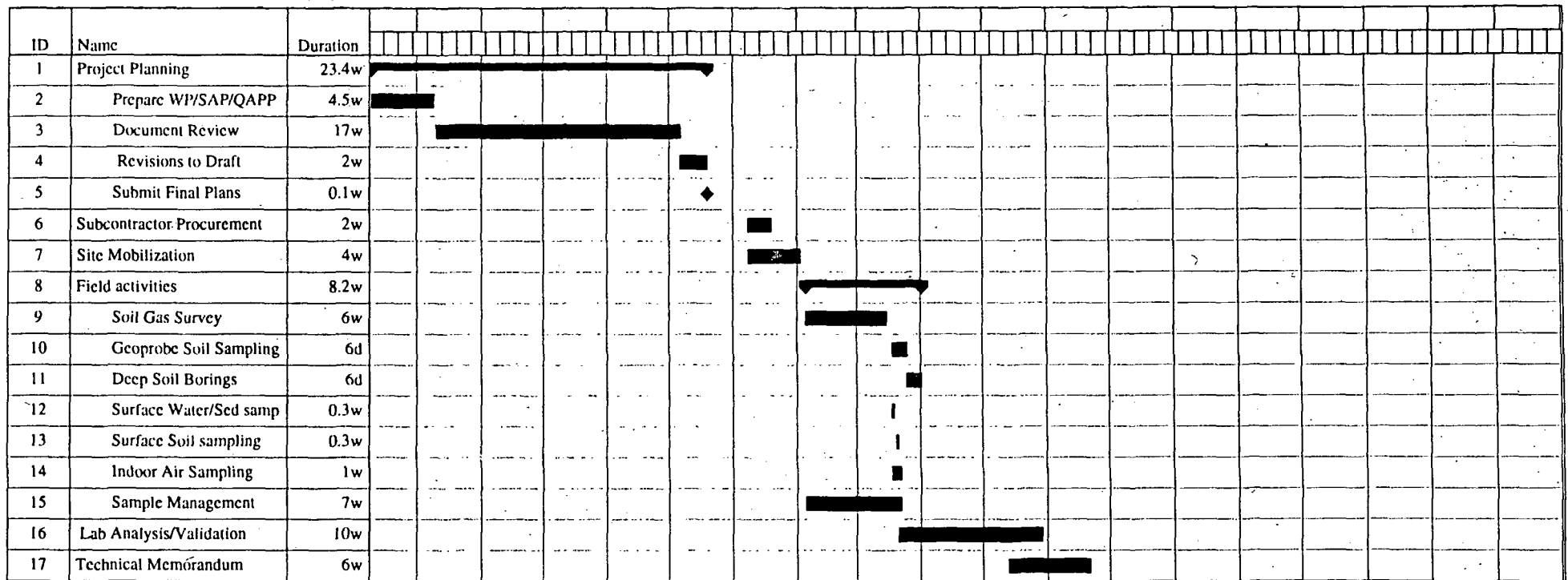
4.0 PROJECT STAFFING

CDM has selected members of the project team to best match the skills of the individuals to the needs of the project. Personnel assigned to the project and their areas of responsibility are given in the QAPP.

5.0 PROJECT SCHEDULE

The schedule for conducting the Southeast Rockford Source Control Operable Unit (SCOU) is shown in Figure 5-1. The schedule illustrates the chronological coordination of tasks from the date of project plan approval. The budget for the SCOU is given in Table 5-1.

FIGURE 5-1
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT SCHEDULE



**SCOU BUDGET BACKUP
FOR
FIELD INVESTIGATION LABOR HOURS**

3.0 Site Mobilization / Utility Clearance

1 person to organize and manage mobilization - 4 days x 10 hours per day	40
1 person to participate in joint utility meet, coordination with local industries in Areas 9/10, and trailer setup - 12 days x 10 hours per day	120
	<hr/> 160

4.0 Soil Gas Survey

1 person to locate and stake soil gas points (including private property, Areas 9/10 and 11) - 5 days x 10 hours per day	50
1 person for 25 days x 10 hours per day	250
This assumes 12 soil gas points per day and total of 298 points	
Equipment and Supply Management	10
Technical Oversight	<hr/> 10
	320

5.0 Geoprobe Soil Sampling

1 person for 6 days x 12 hours per day	72
This assumes 12 samples points per day and total of 74 points	
1 person to manage and execute CLP paperwork for soil samples - 6 days x 12 hours per day	72
Equipment and Supply Management	8
Technical Oversight	<hr/> 8
	160

6.0 Deep Soil Borings

1 person for 8 days x 12 hours per day	96
1 person to manage and execute CLP paperwork for soil samples - 8 days x 12 hours per day	96
Equipment and Supply Management	8
Technical Oversight	<hr/> 8
	208

**SCOU BUDGET BACKUP
FOR
FIELD INVESTIGATION LABOR HOURS**

7.0 Surface Water and Creek Sediment Sampling

2 people for 1 day x 9 hours per day	18
Technical Oversight	<u>2</u>
	20

8.0 Surface Soil Sampling

2 people for 1 day x 9 hours per day	18
Technical Oversight	<u>2</u>
	20

**SCOU BUDGET BACKUP
FOR
FIELD INVESTIGATION
OTHER DIRECT COSTS**

3.0 Site Mobilization / Utility Clearance

Hotel - 1 person for 8 days x \$45 per day	\$360
Meals - 1 person for 8 days x \$24 per day	\$192
Transportation - Personal Vehicle - 800 miles x \$.30 per mile	\$240
Photocopying - 100 pages x \$.10 per page	\$10
Fax - 20 pages x \$1.50 per page	\$30
Express Mail - 10 coolers x \$80 per plus 5 packages x \$ 20 per package	\$900
Telephone	\$60
Computer - 24 hours x \$6 per hour	\$144

Equipment:

Field Trailer (12' x 60') -	Set Up	\$160
	Freight - \$350 each way	\$700
	Rent - 2 months x \$235 per month	\$470
	Plan Table	\$40
	Trailer Chairs - 5 Chairs x \$15 / chair x 2 Mo.	\$150
	Window Blinds - 10 Windows x \$10 each	\$100
	Dismantle Fee	\$95
	Cleaning	\$95

Utilities -	Electric Service Hookup	\$715
	Monthly Electric - 2 months x \$30 per month	\$60
	Phone Service Hookup	\$275
	Monthly Phone - 2 months x \$45 per month	\$90
	Long Distance - 2 months x \$75 per month	\$150

Personal Protective Gear

Steel Toe Boots- 2 pr x 40 days x \$3/day	\$240
Hard Hats--2 hats x 40 days x \$0.5/day	\$40
Safety Glasses- 2 pair x 40 days x \$0.5/day	\$40
Rain Suits--2 suits x 20 days x \$8/day	\$320

Portable Rest Room - 2 months x \$125 per month (bi-weekly service)	\$250
---------------------------------------------------------------------	-------

**SCOU BUDGET BACKUP
FOR
FIELD INVESTIGATION
OTHER DIRECT COSTS**

Fax Rental - 2 months x \$175 per month	\$350
Refrigerator Rental - 2 months x \$50 per month	\$100
Decon Sprayer - 2 units x \$35 per month x 2 months	\$140
Fire Extinguisher - 2 months x \$10 per month	\$20
First Aid Kit - 2 kits x \$8 per kit x 2 months	<u>\$32</u>

Mobilization Equipment Total **\$4,632**

Supplies:

Alconox - 2 boxes x \$13 per box	\$26
Aluminum Foil - 10 Rolls x \$1 per roll	\$10
Distilled Water - 50 gallons x \$4 per gallon	\$200
Note: One bottle contains approximately one half gallon	
Eye Wash Bottles - 3 bottles x \$5 per bottle	\$15
 Stainless Steel Sampling Utensils - 10 scoops x \$5 per scoop	 \$50
Stainless Steel Tray - 2 x \$10 per tray	\$20
Log books - 5 logs x \$11 per log	\$55
Latex Gloves - 15 boxes x \$12 per box	\$180
Rubber Boot Covers - 25 pairs x \$5 per pair	\$125
Markers - 5 x \$1.40 each	\$7
Strapping Tape - 10 rolls x \$3.50 per roll	\$35
Clear Mailing Tape - 5 Rolls x \$4.50 per roll	\$23
Paper Towels - 25 rolls x \$1.00 per roll	\$25

**SCOU BUDGET BACKUP
FOR
FIELD INVESTIGATION
OTHER DIRECT COSTS**

Garbage Bags - 5 boxes x \$10.00 per box	\$50
Vermiculite - (6 cubic foot bag) - 20 bags x \$7 per bag	\$140
Mobilization Supplies Total	\$961
Site Mobilization/Utility Clearance Grand Total	\$7,529

4.0 Soil Gas Survey

Hotel - 1 person for 5 days x \$45 per day	\$225
Hotel - 1 person for 25 days x \$45 per day	\$1,125
Meals - 1 person for 5 days x \$24 per day	\$120
Meals - 1 person for 25 days x \$24 per day	\$600
Supplies - Flagging Tape-5 rolls x 2/roll + 15 bundles stakes x \$5/bundle + 10 cans spray paint x \$5/can	\$135
Transportation - Rental Van - 1 month x \$1000 per month	\$1,000
Transportation - Personal Vehicle - 500 miles x \$.30 per mile	<u>\$150</u>
Soil Gas Survey Total	\$3,355

5.0 Geoprobe Soil Sampling

Hotel - 2 people for 6 days x \$45 per day	\$540
Meals - 2 people for 6 days x \$24 per day	\$288
Supplies - 2 Log books x \$11 +2 roll visqueen x \$42 + 20 boxes ziploc bags x \$3 + 60 bags ice x \$1/bag	\$226
Transportation - Rental Van - 2 weeks x \$250 per week	\$500
Transportation - Personal Vehicle - 450 miles x \$.30 per mile	<u>\$135</u>
Geoprobe Soil Sampling Total	\$1,689

6.0 Deep Soil Borings

Hotel - 2 people for 8 days x \$45 per day	\$720
--------------------------------------------	-------

**SCOU BUDGET BACKUP
FOR
FIELD INVESTIGATION
OTHER DIRECT COSTS**

Meals - 2 people for 8 days x \$24 per day \$384

Supplies - 2 Log books x \$11 +2 roll visqueen x \$42 + 10 boxes ziploc
bags x \$3 + 30 bags ice x \$1/bag \$166

Transportation - Rental Van - 2 weeks x \$250 per week \$500

Transportation - Personal Vehicle - 450 miles x \$.30 per mile \$135

Deep Soil Borings Total **\$1,905**

7.0 Surface Water and Creek Sediment Sampling

Supplies - 1 Log book x \$11 +1 roll visqueen x \$42 + 2 boxes ziploc
bags x \$3 + 10 bags ice x \$1/bag \$69

Transportation - Rental Sedan - 1 day x \$50 per day \$50

Transportation - Personal Vehicle - 200 miles x \$.30 per mile \$60

Surface Water and Creek Sediment Sampling Total **\$179**

8.0 Surface Soil Sampling

Supplies - 1 Log book x \$11 +1 roll visqueen x \$42 + 2 boxes ziploc
bags x \$3 + 10 bags ice x \$1/bag \$69

Transportation - Rental Sedan - 1 day x \$50 per day \$50

Transportation - Personal Vehicle - 200 miles x \$.30 per mile \$60

Surface Soil Sampling Total **\$179**

Task Description	Professional 5		Professional 4		Professional 3		Professional 2		Professional 1		Technician 2		Technician 1		Clerical		Total Labor	
	\$51.50 / Hour		\$39.14 / Hour		\$28.84 / Hour		\$22.66 / Hour		\$17.51 / Hour		\$15.04 / Hour		\$11.33 / Hour		\$13.18 / Hour			
	Hours	\$	Hours	\$	Hours	\$	Hours	\$	Hours	\$	Hours	\$	Hours	\$	Hours	\$	Hours	\$
1.0 Prepare Draft Work Plan / SAP / QAPP	0	\$0	48	\$1,879	100	\$2,884	230	\$5,212	40	\$700	60	\$902	0	\$0	64	\$844	542	\$12,421
1.0 Prepare Final Work Plan / SAP / QAPP	0	\$0	24	\$939	0	\$0	24	\$544	16	\$280	16	\$241	0	\$0	20	\$264	100	\$2,268
2.0 Subcontractor Procurement	0	\$0	0	\$0	16	\$461	24	\$544	24	\$420	8	\$120	0	\$0	4	\$53	76	\$1,599
3.0 Site Mobilization / Utility Clearance	0	\$0	0	\$0	0	\$0	0	\$0	80	\$1,401	80	\$1,203	0	\$0	0	\$0	160	\$2,604
4.0 Soil Gas Survey	0	\$0	10	\$391	0	\$0	155	\$3,512	155	\$2,714	0	\$0	0	\$0	0	\$0	320	\$6,618
5.0 Geoprobe Soil Sampling	0	\$0	8	\$313	0	\$0	76	\$1,722	76	\$1,331	0	\$0	0	\$0	0	\$0	160	\$3,366
6.0 Deep Soil Borings & IDW Disposal	0	\$0	8	\$313	0	\$0	96	\$2,175	104	\$1,821	0	\$0	0	\$0	0	\$0	208	\$4,310
7.0 Surface Water and Creek Sediment Sampling	0	\$0	2	\$78	0	\$0	9	\$204	9	\$158	0	\$0	0	\$0	0	\$0	20	\$440
8.0 Surface Soil Sampling	0	\$0	2	\$78	0	\$0	9	\$204	9	\$158	0	\$0	0	\$0	0	\$0	20	\$440
9.0 Indoor Air Sampling	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
10.0 Sample Management	0	\$0	0	\$0	40	\$1,154	50	\$1,133	50	\$876	0	\$0	0	\$0	40	\$527	180	\$3,689
11.0 Technical Memorandum	0	\$0	40	\$1,566	160	\$4,614	160	\$3,626	120	\$2,101	40	\$602	0	\$0	60	\$791	580	\$13,299
12/13 Project Management and Administration	16	\$824	160	\$6,262	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	60	\$791	236	\$7,877
TOTALS	16	\$824	302	\$11,820	316	\$9,113	833	\$18,976	683	\$11,959	204	\$3,068	0	\$0	248	\$3,269	2602	\$58,930

Table 5-1
Southeast Rockford
Source Control Operable Unit
Proposed Budget

Task Description	Total Labor	Direct Labor	Indirect Labor	Total Labor	ODCs	Subcontractor Costs	Total Costs
	Hours	\$	\$	\$	\$	\$	\$
1.0 Prepare Draft Work Plan / SAP / QAPP	542	\$12,421	\$22,097	\$34,518	\$1,755	\$0	\$36,273
1.0 Prepare Final Work Plan / SAP / QAPP	100	\$2,268	\$4,034	\$6,302	\$1,915	\$0	\$8,217
2.0 Subcontractor Procurement	76	\$1,599	\$2,844	\$4,442	\$655	\$0	\$5,097
3.0 Site Mobilization / Utility Clearance	160	\$2,604	\$4,633	\$7,237	\$7,529	\$0	\$14,766
4.0 Soil Gas Survey	320	\$6,618	\$11,773	\$18,391	\$3,355	\$72,000	\$93,746
5.0 Geoprobe Soil Sampling	160	\$3,366	\$5,988	\$9,354	\$1,689	\$10,000	\$21,043
6.0 Deep Soil Borings & IDW Disposal	208	\$4,310	\$7,667	\$11,976	\$1,905	\$56,000	\$69,881
7.0 Surface Water and Creek Sediment Sampling	20	\$440	\$782	\$1,222	\$179	\$0	\$1,401
8.0 Surface Soil Sampling	20	\$440	\$782	\$1,222	\$179	\$0	\$1,401
9.0 Indoor Air Sampling	0	\$0	\$0	\$0	\$0	\$0	\$0
10.0 Sample Management	180	\$3,689	\$6,563	\$10,253	\$800	\$0	\$11,053
11.0 Technical Memorandum	580	\$13,299	\$23,659	\$36,958	\$3,645	\$0	\$40,603
12/13 Project Management and Administration	236	\$7,877	\$14,014	\$21,891	\$0	\$0	\$21,891
TOTALS	2602	\$58,930	\$104,836	\$163,765	\$23,606	\$138,000	\$325,371
							+
						Fee	\$25,837
							=
						Final Total	\$351,208

Table 5-1
Southeast Rockford
Source Control Operable Unit
Proposed Budget

**FINAL
SOUTHEAST ROCKFORD
GROUNDWATER CONTAMINATION
SOURCE CONTROL OPERABLE UNIT
QUALITY ASSURANCE
PROJECT PLAN
ADDENDUM**

FEBRUARY 1996

Prepared For:

**ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY
BUREAU OF LAND
FEDERAL SITES MANAGEMENT UNIT**

Prepared By:

CAMP DRESSER & MCKEE INC.

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LIST OF ACRONYMS/ ABBREVIATIONS

CDM	Camp Dresser & McKee
CLP	Contract Laboratory Program
CRQL	Contract Required Quantitation Limits
EMSL	Environmental Measurements System Laboratory (USEPA)
FM	Field Manager
FS	Feasibility Study
GC/MS	Gas Chromatography/Mass Spectroscopy
HSP	Health and Safety Plan
IDPH	Illinois Department of Public Health
MCL	Maximum Contaminant Level
NPL	Non Aqueous Phase Liquid
OVA	Organic Vapor Analyzer
PRS	Proposed Illinois Groundwater Quality Standards
QAC	Quality Assurance Coordinator
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RAL	Remedial Action Level
RAS	Routine Analytical Services (CLP)
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RPM	Remedial Project Manager (USEPA)
RPO	Regional Project Officer (USEPA)
RSCC	Regional Sample Control Coordinator
SAP	Sampling and Analysis Plan
SAS	Special Analytical Services (CLP)
SDWA	Safe Drinking Water Act
SIPM	Site Investigation Procedures Manual
SM	Site Manager
SMO	Sample Management Office
SOP	Standard Operating Procedure
SOW	Statement of Work
TAL	Target Analyte List
TAT	Technical Assistance Team
TCL	Target Compound List
USEPA	U.S. Environmental Protection Agency
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
WA	Work Assignment

QUALITY ASSURANCE PROJECT PLAN ADDENDUM
SOURCE CONTROL OPERABLE UNIT
SOUTHEAST ROCKFORD SITE, ROCKFORD, ILLINOIS
NOVEMBER 1995

Approved By: Wm. Timp-Ballard
USEPA Region V
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Date: 2/8/96

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Date: 2/8/96

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Date: _____

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Date: 3-13-96

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Date: 3/13/96

Approved By: Wendy J. Deaton
Camp Dresser & McKee Inc.
Project Manager

Date: 3/18/96

Approved By: Francis B. Barker
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Date: 3/18/96

1.0 PROJECT DESCRIPTION

The Southeast Rockford Groundwater Contamination Source Control Operable Unit investigation will include a soil gas survey, shallow soil sampling by geoprobe and deep soil borings for the purpose of better defining contaminant source areas, evaluating the presence of non-aqueous phase liquids (NAPLs) in the soils, developing appropriate clean-up levels for soils and evaluating feasible remedial alternatives and/or the need for additional studies.

1.1 STUDY AREA BACKGROUND

The study area background is provided in Section 1.1, page 1-1 of the approved Southeast Rockford Groundwater Contamination Phase II QAPP, March 1993 and the Southeast Rockford Groundwater Contamination Phase II Remedial Investigation Report, June 1994. Additional background is provided in Section 2.0 of the Sampling and Analysis Plan.

1.2 PROJECT SCOPE AND OBJECTIVES

As stated in the Source Control Operable Unit (SCOU), additional investigation will be conducted at Areas 4, 7, 9/10, and 11. These areas either contain or are likely to contain significant concentrations of VOCs that contribute to groundwater contamination in the study area. Principal objectives of the SCOU are to:

- Conduct a soil gas survey, collect soil samples using geoprobe and drill deep soil borings to better define the source areas.
- Evaluate the potential for any dense non-aqueous phase liquids (NAPLs) in the soils through the collection of soil samples in the deep soil borings.

- Determine the nature and extent of organic contaminants in surface water and sediments north of area 7.
- Assess whether contamination is present in residential and park areas through the collection of surface soil samples.
- Gather sufficient site data to perform a risk assessment and focused feasibility study at a later date.

In order to achieve these objectives, CDM will work to obtain the following sets of data:

- (1) Soil gas and subsurface soil data in vadose zone of source areas;
- (2) Subsurface evaluation of NAPL in soil;
- (3) Data on organic contamination in sediments and surface water; and
- (4) Data on organic and inorganic contamination in surface soils.

Field work will be conducted as described in Section 3.7 and 3.8 of the Work Plan. This work is a continuation of the work performed under the Phase II QAPP. The procedures used to perform these tasks are described in detail in the Sampling and Analysis Plan (SAP).

1.3 SAMPLING NETWORK DESIGN AND RATIONALE

The scope of sampling for the Source Control Operable Unit includes 298 soil gas samples; 150 subsurface soil samples collected during geoprobing; 19 subsurface soil samples collected during drilling of deep soil borings; 20 surface soil samples and three surface water and four sediment samples. Table 1-1 is a summary of the sampling and analysis network and

**SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT**

Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Samples ¹	QC Samples		Matrix Total
				Field Duplicates	Field Blank	
Subsurface soil samples collected during geo-probe work	Qualitative organic vapor screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	150	8	-	158
		CLP RAS B/N/A Extractables ^{2,5}	88	5	-	93
		CLP RAS Pesticides/PCBs ^{2,5}	88	5	-	93
Deep soil borings - Soils collected during drilling	Qualitative organic vapor screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	19	1	-	20
		CLP RAS Metals and Cyanide ^{3,4}	12	1	-	13
Area 7 Creek Sediment	Qualitative screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	4	1	-	5
		CLP RAS B/N/A Extractables ^{2,5}	4	1	-	5
		CLP RAS Pesticides/PCBs ^{2,5}	4	1	-	5
Area 7 Surface Water	pH, conductivity, temperature	CLP RAS Volatile Organics ^{2,5}	3	1	1	5
		CLP RAS B/N/A Extractables ^{2,5}	3	1	1	5
		CLP RAS Pesticides/PCBs ^{2,5}	3	1	1	5
Surface Soil	Qualitative organic vapor screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	20	1	-	21
		CLP RAS B/N/A Extractables ^{2,5}	20	1	-	21
		CLP RAS Pesticides/PCBs ^{2,5}	20	1	-	21
		CLP RAS Metals and Cyanide ^{3,4}	20	1	-	21
Soil Gas Samples	Field GC for 1, 2-DCE, TCA, TCE, PCE, VC, and BETX		298	0	60	358

1. Frequency of collection for all investigative and QC samples is 1.

2. Contract Laboratory Program Routine Analytical Services (CLP RAS) volatile, extractable and pesticide/PCB compounds are listed in Tables 3-1 through 3-3 of the QAPP.

3. Contract Laboratory Program Routine Analytical Services (CLP RAS) inorganic parameters are listed in Table 3-4 of the QAPP.

4. No extra sample volume is required for soil matrix spike/matrix spike duplicate (MS/MSD) samples.

5. Samples collected for MS/MSD analysis will be collected at double the volume.

6. One trip blank will be shipped with each shipment of volatile organics (water samples only).

7. MS/MSDs will be collected at a frequency of one per group of 20 or fewer samples.

8. Field blanks for soil gas consist of rinseate blanks.

specifies the sample matrix, the parameters to be measured, the number of samples to be collected, and the level of QC effort for each sample type.

All sampling and testing will conform to guidelines set forth in the User's Guide to the EPA Contract Laboratory Program. The QAPP and sections of the SAP discuss the specific sampling and analytical procedures to be followed for this project. Sampling network design and rationale are discussed in the SAP and in subsections 3.7 and 3.8 of the Work Plan.

Based the previous studies at the site (Groundwater Operable Unit and Phase I and II investigations) the primary contaminants of concern for the site are volatile organics. Specifically:

- 1,1,1 - Trichloroethane (TCA)
- Trichloroethene (TCE)
- 1,1,2,2 - Tetrachbroethene (PCE)
- 1,1 - Dichloroethane (1,1-DCA)
- 1,1 - Dichloroethene (1,1-DCE)
- 1,2 - Dichloroethene (1,2-DCE)
- Vinyl Chloride (VC)
- Benzene
- Ethylbenzene
- Toluene
- Zylene

During source area work in Phase II some semi-volatile and pesticide/PCBs were detected in "hot spots". Therefore this investigation will focus on organic contaminants, primarily volatiles. In Areas 4, 7, and 11, there is sufficient existing information on semi-volatile organics, pesticides/PCBs and inorganics in subsurface soils to eliminate them from the

parameters of concern for this phase. Area 9/10 has little subsurface soil data available so the majority of the full RAS analysis will be conducted in this area.

1.4 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support decisions made during RI/FS activities and are based on the end uses of the data to be collected. As such, different data uses may require different levels of data quality. There are five analytical levels which address various data uses and the QA/QC effort and methods required to achieve the desired level of quality. These levels are:

- Screening (DQO Level 1): This provides the lowest data quality but the most rapid results. It is often used for health and safety monitoring at the site, preliminary comparison to ARARs, initial site characterization to locate areas for subsequent and more accurate analyses, and for engineering screening of alternatives (bench-scale tests). These types of data include those generated on-site through the use of HNu, pH, conductivity, and other real-time monitoring equipment at the site.
- Field Analyses (DQO Level 2): This provides rapid results and better quality than in Level 1. This level includes mobile lab-generated data depending on the level of quality control exercised. Level 2 data will be generated by onsite GC analysis of soil gas.
- Engineering (DQO Level 3): This provides an intermediate level of data quality and is used for site characterization. Engineering analyses may include mobile lab-generated data and some analytical lab methods (e.g., laboratory data with quick turnaround used for screening but without full quality control documentation). Level

3 data will not be generated during the SCOU.

- Confirmational (DQO Level 4): This provides the highest level of data quality and is used for purposes of risk assessment, evaluation of remedial alternatives, and PRP determination. These analyses require full Contract Laboratory Program (CLP) analytical and data validation procedures in accordance with EPA recognized protocol. Level 4 data will be generated from the collection of soil, sediment and surface water samples analyzed for TCL organics and TAL inorganics (see Table 1-2).
- Non-Standard (DQO Level 5): This refers to analyses by non-standard protocols, for example, when exacting detection limits or analysis of an unusual chemical compound is required. These analyses often require method development or adaptation. The level of quality control is usually similar to DQO Level 4 data. Level 5 data will not be generated during the SCOU.

1.5 SCHEDULE

The anticipated schedule for key activities in this SCOU is provided in the Work Plan Section 5.0.

TABLE 1-2
SOUTHEAST ROCKFORD SCOU
PRELIMINARY DATA QUALITY OBJECTIVES SUMMARY

DATA GATHERING ACTIVITY	SOIL GAS SURVEY	GEO-PROBE AND SOIL BORING INSTALLATION	SURFACE WATER SAMPLING	SEDIMENT SAMPLING	SURFACE SOIL SAMPLING
Objectives and Data uses	Identify contaminated areas during source investigation	Confirm and further define nature of contamination in "hot spots" identified in soil gas survey	Evaluate impacts from area 7 on surface water	Evaluate impacts from area 7 on sediment	Access if contamination is present in residential and park areas
	Evaluate need for additional study/immediate remedial action	Evaluate need for additional study/immediate remedial action Provide information to evaluate presence of NAPL in subsurface soils	Evaluate need for additional study/remedial action Provide data to evaluate health and environmental risks	Evaluate need for additional study/remedial action Provide data to evaluate health and environmental risks	Evaluate need for additional study/remedial action Provide data to evaluate health and environmental risks
	Provide source information for evaluation of contaminant fate and transport	Provide data to determine preliminary remediation goals			
	Provide information to design treatability studies				
Appropriate Analytical Levels	Screening level site evaluation: Level 2	Site characterization: Level 4	Site characterization: Level 4	Site characterization: Level 4	Site characterization: Level 4
Data Needs	Target VOCs 1,2 DCE, DCA, TCE, TCA, PCE and BETX in potential source areas to target the soil boring program and design treatability studies	CLP TCL organics and CLP TAL inorganics to evaluate areas of likely high VOC concentrations	CLP TCL organics to evaluate impacts from area 7	CLP TCL organics to evaluate impacts from area 7	CLP TCL organics and inorganics to characterize contamination

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Camp Dresser and McKee Inc. (CDM), as prime contractor, has overall responsibility for all phases of the Southeast Rockford Source Control Operable Unit (SCOU) and will oversee the field investigations and prepare the Technical Memorandum. CDM will also provide QA/QC for all deliverables and provide for their issuance.

2.1 PROJECT ORGANIZATION

The project organization structure (see Figure 2-1) shows the staff designations, assignments and lines of communication for the SCOU.

2.2 IEPA PERSONNEL

2.2.1 PROJECT MANAGER

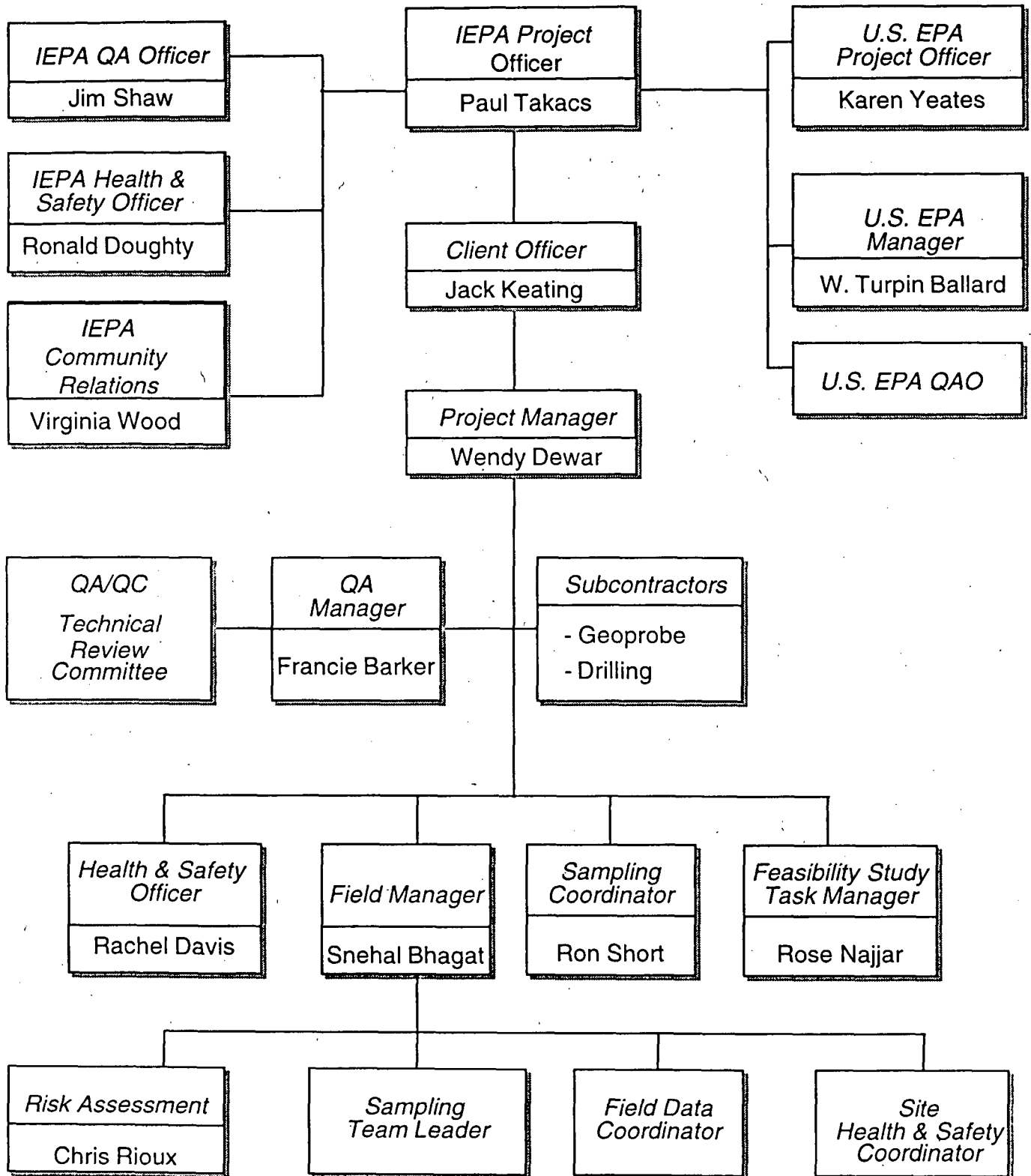
Project Manager, Mr. Paul Takacs, is responsible for overall management and coordination of technical and fiscal aspects of the SCOU. Mr. Takacs will be the IEPA contact with the USEPA Region V Project Manager.

2.2.2 QUALITY ASSURANCE OFFICER

The Quality Assurance Section Project Officer, Mr. Jim Shaw, is responsible for the QAPP technical review. Mr. Shaw is available for consultation on various QA/QC issues.

Southeast Rockford Source Control Operable Unit Organization Chart

Figure 2-1



2.2.3 HEALTH AND SAFETY OFFICER

The Health and Safety Officer, Mr. Ronald Doughty, is responsible for the review of the Health and Safety Plan.

2.3 USEPA PERSONNEL

2.3.1 STATE PROJECT OFFICER

The USEPA State Project Officer, Mr. John Oakes, is responsible for federal oversight of state-lead activities for the state of Illinois.

2.3.2 REMEDIAL PROJECT MANAGER

The USEPA Region V Remedial Project Manager, Mr. Turpin Ballard, is responsible for oversight of the SCOU.

2.3.3 LABORATORY TESTING ASSIGNMENTS

- Terra-Trace will analyse the soil gas samples onsite with a field GC using the procedures described in Appendix A.
- USEPA Contract Laboratory Program (CLP) will analyze all liquid and soil samples except for screening-level samples as part of the Routine Analytical Services.

2.3.4 LABORATORY QA/QC RESPONSIBILITIES

- Soil Gas Samples
 - Requests initiated by CDM sampling team
 - QA/QC procedures described in Appendix A
 - Final data review by CDM Project Organization

- CLP Routine Analytical Services (RAS)
 - Request initiated by CDM sampling team
 - Support Services Branch, Office of Emergency and Remedial Response, USEPA Headquarters
 - USEPA EMSL, Las Vegas
 - Final data review by CDM Project Organization
 - Review of tentatively identified compounds and assessment of need for confirmation by CDM Project Organization

2.3.5 REGIONAL SAMPLE CONTROL COORDINATOR

The USEPA Region V Regional Sample Control Coordinator (RSCC) will be the contact point for the scheduling of CLP RAS analyses. The RSCC will be responsible for training the CDM Field Team Leader in the use of the USEPA CLP and its associated paperwork.

2.4 CONTRACTOR PERSONNEL

CDM, as contractor to IEPA, will analyze the data generated by the SCOU field activities. CDM will be responsible for completion of tasks specified in the Statement of Work which includes field measurements, sample collection, and the preparation of the Technical Memorandum.

2.4.1 PROJECT MANAGER

The Project Manager is responsible for day-to-day management and coordination of the contractor staff. This duty includes, but is not limited to, ensuring that all contractor and subcontractor staff understand and comply with the QA/QC program. The Project Manager is responsible for the Work Plan and review of data generated from field measurements and activities. The Project Manager will also be responsible for preparing the Technical Memorandum.

2.4.2 PROJECT QUALITY ASSURANCE MANAGER

The CDM Quality Assurance Manager is responsible for providing specific QA support to the Project Manager and coordinating QA technical operations among task teams performing duties that are assigned to CDM during this SCOU.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide results which are legally defensible in a court of law. Specific procedures to be used for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal quality control, audits, preventive maintenance of field equipment, and corrective action are described in other sections of this QAPP. The purpose of this section is to address the specific objectives for accuracy, precision, completeness, representativeness, and comparability.

3.1 LEVEL OF QUALITY CONTROL EFFORT

Field blank, trip blank, duplicate and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling program. Field and trip blanks consist of distilled water, will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Field blank samples are analyzed to check for procedural contamination at the site which may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage. Duplicate samples are analyzed to check for sampling and analytical reproducibility. Matrix spikes provide information about the effect of the sample matrix on the digestion and measurement methodology. All matrix spikes are performed in duplicate and are hereinafter referred to as MS/MSD samples. One matrix spike/matrix spike duplicate will be collected for every 20 or fewer investigative samples. MS/MSD samples are designated/collected for organic analyses being sent to the CLP only.

The general level of the QC effort will be one field duplicate and one field blank for every 20 or fewer investigative samples. One volatile organic analysis (VOA) trip blank consisting of distilled deionized ultra-pure water will be included along with each shipment of aqueous VOA samples.

MS/MSD samples are investigative samples. Soil MS/MSD samples require no extra volume for VOCs or extractable organics. However, aqueous MS/MSD samples must be collected at triple the volume for VOCs and double the volume for extractable organics. One MS/MSD sample will be collected/designated for every 20 or fewer investigative samples per sample matrix (i.e., groundwater, soil). The number of duplicate and field blank samples to be collected are listed in Table 1-1. Sampling procedures are specified in the Sampling and Analysis Plan.

The specific level of field QC effort for the Southeast Rockford SCOU is described in Section 3.0 of the Sampling and Analysis Plan (SAP) and is summarized by sample matrix and parameter in Table 1-1 of this QAPP addendum.

Soil gas samples collected with the geoprobe will be screened for volatile organics. The level of laboratory QC effort for these samples is described in Appendix A.

All other soil, surface water, and sediment samples will be sent to the CLP Laboratory for analysis. The analysis will be according to RAS protocols (Analytical Level IV) for organics and inorganics. The level of laboratory QC effort for RAS analysis provided by the CLP is specified in the current statements of work (SOW/OLM03.1 for organic and SOW/ILM03.0 for inorganic analyses) for CLP, or the most current version. Tables 3-1, 3-2, 3-3, and 3-4 contain the quantitation levels for organic and inorganic compounds (low and medium concentrations), respectively.

TABLE 3-1

VOLATILES TARGET COMPOUND LIST (TCL) AND CONTRACT
REQUIRED QUANTITATION LIMITS

Volatiles	CAS Number	Quantitation Limits*			
		Water ug/L	Low Soil ug/Kg	Med. Soil ug/Kg	On Column (ng)
1. Chloromethane	74-87-3	10	10	1200	(50)
2. Bromomethane	74-83-9	10	10	1200	(50)
3. Vinyl Chloride	75-01-4	10	10	1200	(50)
4. Chloroethane	75-00-3	10	10	1200	(50)
5. Methylene Chloride	75-09-2	10	10	1200	(50)
6. Acetone	67-64-1	10	10	1200	(50)
7. Carbon Disulfide	75-15-0	10	10	1200	(50)
8. 1,1-Dichloroethene	75-35-4	10	10	1200	(50)
9. 1,1-Dichloroethane	75-34-3	10	10	1200	(50)
10. 1,2-Dichloroethene (total)	540-59-0	10	10	1200	(50)
11. Chloroform	67-66-3	10	10	1200	(50)
12. 1,2-Dichloroethane	107-06-2	10	10	1200	(50)
13. 2-Butanone	78-93-3	10	10	1200	(50)
14. 1,1,1-Trichloroethane	71-55-6	10	10	1200	(50)
15. Carbon Tetrachloride	56-23-5	10	10	1200	(50)
16. Bromodichloromethane	75-27-4	10	10	1200	(50)
17. 1,2-Dichloropropane	78-87-5	10	10	1200	(50)
18. cis-1,3-Dichloropropene	10061-01-5	10	10	1200	(50)
19. Trichloroethene	79-01-6	10	10	1200	(50)
20. Dibromochloromethane	124-48-1	10	10	1200	(50)
21. 1,1,3-Trichloroethane	79-00-5	10	10	1200	(50)
22. Benzene	71-43-2	10	10	1200	(50)
23. trans-1,3-Dichloropropene	10061-02-6	10	10	1200	(50)
24. Bromoform	75-25-2	10	10	1200	(50)
25. 4-Methyl-2-pentanone	108-10-1	10	10	1200	(50)
26. 2-Hexanone	591-78-6	10	10	1200	(50)
27. Tetrachloroethene	127-18-4	10	10	1200	(50)
28. 1,1,2,2-Tetrachloroethane	79-34-5	10	10	1200	(50)
29. Toluene	108-88-3	10	10	1200	(50)
30. Chlorobenzene	108-90-7	10	10	1200	-50
31. Ethylbenzene	100-41-4	10	10	1200	(50)
32. Styrene	100-42-5	10	10	1200	(50)
33. Xylenes (total)	1330-20-7	10	10	1200	(50)

*Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Note: CLP RAS analysis following SOW/OLM3.1 or most current version.

TABLE 3-2

SEMIVOLATILES TARGET COMPOUND LIST (TCL) AND CONTRACT
REQUIRED QUANTITATION LIMITS

Semivolatiles	CAS Number	Quantitation Limits*			
		Water	Low	Med.	On
		ug/L	ug/Kg	ug/Kg	Column (ng)
34. Phenol	108-95-2	10	330	10000	(20)
35. bis-(2-Chloroethyl) ether	111-44-4	10	330	10000	(20)
36. 2-Chlorophenol	95-57-8	10	330	10000	(20)
37. 1,3-Dichlorobenzene	541-73-1	10	330	10000	(20)
38. 1,4-Dichlorobenzene	106-46-7	10	330	10000	(20)
39. 1,2-Dichlorobenzene	95-50-1	10	330	10000	(20)
40. 2-Methylphenol	95-48-7	10	330	10000	(20)
41. 2,2'-oxybis (1-Chloropropane) ¹	108-60-1	10	330	10000	(20)
42. 4-Methylphenol	106-44-5	10	330	10000	(20)
43. N-Nitroso-di-n-propylamine	621-64-7	10	330	10000	(20)
44. Hexachloroethane	67-72-1	10	330	10000	(20)
45. Nitrobenzene	98-95-3	10	330	10000	(20)
46. Isophorone	78-59-1	10	330	10000	(20)
47. 2-Nitrophenol	88-75-5	10	330	10000	(20)
48. 2,4-Dimethylphenol	105-67-9	10	330	10000	(20)
49. bis(2-Chloroethoxy) methane	111-91-1	10	330	10000	(20)
50. 2,4-Dichlorophenol	120-83-2	10	330	10000	(20)
51. 1,2,4-Trichlorobenzene	120-82-1	10	330	10000	(20)
52. Naphthalene	91-20-3	10	330	10000	(20)
53. 4-Chloroaniline	106-47-8	10	330	10000	(20)
54. Hexachlorobutadiene	87-68-3	10	330	10000	(20)
55. 4-Chloro-3-methylphenol	59-50-7	10	330	10000	(20)
56. 2-Methylnaphthalene	91-57-6	10	330	10000	(20)
57. Hexachlorocyclo-pentadiene	77-47-4	10	330	10000	(20)
58. 2,4,6-Trichlorophenol	88-06-2	10	330	10000	(20)
59. 2,4,5-Trichlorophenol	95-95-4	10	830	25000	(50)
60. 2-Chloronaphthalene	91-58-7	10	330	10000	(20)
61. 2-Nitroaniline	88-74-4	10	830	25000	(50)

¹Previously known by the name bis(2-Chloroisopropyl) ether.

Note: CLP RAS analysis following SOW/OLM3.1 or most current version.

Semivolatiles	CAS Number	Quantitation Limits*			
		Water	Low	Med.	On
		ug/L	Soil	Soil	Column
			ug/Kg	ug/Kg	(ng)
62. Dimethylphthalate	131-11-3	10	330	10000	(20)
63. Acenaphthylene	208-96-8	10	330	10000	(20)
64. 2,6-Dinitrotoluene	606-20-2	10	330	10000	(20)
65. 3-Nitroaniline	99-09-2	25	830	25000	(50)
66. Acenaphthene	83-32-9	10	330	10000	(20)
67. 2,4-Dinitrophenol	51-28-5	25	830	25000	(50)
68. 4-Nitrophenol	100-02-7	25	830	25000	(50)
69. Dibenzofuran	132-64-9	10	330	10000	(20)
70. 2,4-Dinitrotoluene	121-14-2	10	330	10000	(20)
71. Diethylphthalate	84-66-2	10	330	10000	(20)
72. 4-Chlorophenyl-phenyl ether	7005-72-3	10	330	10000	(20)
73. Flourene	86-73-7	10	330	10000	(20)
74. 4-Nitroaniline	100-01-6	25	830	25000	(50)
75. 4,6-Dinitro-2-methylphenol	534-52-1	25	830	25000	(50)
76. N-Nitroso-diphenylamine	86-30-6	10	330	10000	(20)
77. 4-Bromophenyl-phenylether	101-55-3	10	330	10000	(20)
78. Hexachlorobenzene	118-74-1	10	330	10000	(20)
79. Pentachlorophenol	87-86-5	25	830	25000	(50)
80. Phenanthrene	85-01-8	10	330	10000	(20)
81. Anthracene	120-12-7	10	330	10000	(20)
82. Carbazole	86-74-8	10	330	10000	(20)
83. Di-n-butylphthalate	84-74-2	10	330	10000	(20)
84. Fluoranthene	206-44-0	10	330	10000	(20)
85. Pyrene	129-00-0	10	330	10000	(20)
86. Butylbenzylphthalate	85-68-7	10	330	10000	(20)
87. 3,3'-Dichlorobenzidine	91-94-1	10	330	10000	(20)
88. Benzo(a)anthracene	56-55-3	10	330	10000	(20)
89. Chrysene	218-01-9	10	330	10000	(20)
90. bis(2-Ethylhexyl) phthalate	117-81-7	10	330	10000	(20)
91. Di-n-octylphthalate	117-84-0	10	330	10000	(20)
92. Benzo (b) flouranthene	205-99-2	10	330	10000	(20)
93. Benzo (k) flouranthene	207-08-9	10	330	10000	(20)
94. Benzo(a)pyrene	50-32-8	10	330	10000	(20)
95. Indeno (1,2,3-cd)-pyrene	193-39-5	10	330	10000	(20)
96. Dibenzo(a,h)-anthracene	53-70-3	10	330	10000	(20)
97. Benzo (g,h,i) perylene	191-24-2	10	330	10000	(20)

*Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Note: CLP RAS analysis following SOW/OLM3.1 or most current version.

TABLE 3-3

PESTICIDES/AROCLORS TARGET COMPOUND LIST (TCL) AND CONTRACT REQUIRED
QUANTITATION LIMITS^{2,3,4}

Pesticides/PCBs	CAS Number	Quantitation Limits		
		Water ug/L	Low Soil ug/Kg	On Column (ng)
98. alpha-BHC	319-84-6	0.050	1.7	5
99. beta-BHC	319-85-7	0.050	1.7	5
100. delta-BHC	319-86-8	0.050	1.7	5
101. gamma-BHC (Lindane)	58-89-9	0.050	1.7	5
102. Heptachlor	76-44-8	0.050	1.7	5
103. Aldrin	309-00-2	0.050	1.7	5
104. Heptachlor epoxide ⁵	111024-57-3	0.050	1.7	5
105. Endosulfan I	959-98-8	0.050	1.7	5
106. Dieldrin	60-57-1	0.10	3.3	10
107. 4,4'-DDE	72-55-9	0.10	3.3	10
108. Endrin	72-20-8	0.10	3.3	10
109. Endosulfan II	33213-65-9	0.10	3.3	10
110. 4,4'-DDD	72-54-8	0.10	3.3	10
111. Endosulfan sulfate	1031-07-8	0.10	3.3	10
112. 4,4'-DDT	50-29-3	0.10	3.3	10
113. Methoxychlor	72-43-5	0.50	17	50
114. Endrin ketone	53494-70-5	0.10	3.3	10
115. Endrin aldehyde	7421-93-4	0.10	3.3	10
116. alpha-Chlordane	5103-71-9	0.050	1.7	5
117. gamma-Chlordane	5103-74-2	0.050	1.7	5
118. Toxaphene	8001-35-2	5.0	170	500
119. Aroclor-1016	12674-11-2	1.0	33	100
120. Aroclor-1221	11104-28-2	2.0	67	200
121. Aroclor-1232	11141-16-5	1.0	33	100
122. Aroclor-1242	53469-21-9	1.0	33	100
123. Aroclor-1248	12672-29-6	1.0	33	100
124. Aroclor-1254	11097-69-1	1.0	33	100
125. Aroclor-1260	11096-82-5	1.0	33	100

²There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of pesticides/Aroclors.

³The lower reporting limit for pesticide instrument blanks shall be one-half the CRQL values for water samples.

⁴Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

⁵Only the exo-epoxy isomer (isomer B) of the heptachlor epoxide is reported on the data reporting forms.

Note: CLP RAS analysis following SOW/OLM03.1 or most current version

TABLE 3-4

METALS TARGET ANALYTE LIST (TAL) AND CONTRACT REQUIRED QUANTITATION LIMITS

Analyte	Contract Required Detection Limit ^(1,2) (ug/L)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20

- (1) Subject to the restrictions specified in the first page of Part G, Section IV of Exhibit D (Alternate Methods - Catastrophic Failure) any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Limit (CRDL) requirements. Higher detection limits may only be used in the following circumstance:

If the sample concentration exceeds five times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the Contract Required Detection Limit. This is illustrated in the example below:

For lead:

Method in use = ICP

Instrument Detection Limit (IDL) = 40

Sample concentration = 220

Contract Required Detection Limit (CRDL) = 3

The value of 220 may be reported even though the instrument detection limit is greater than CRDL. The instrument or method detection limit must be documented as described in Exhibits B and E.

- (2) The CRDLs are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E. The detection limits for samples may be considerably higher depending on the sample matrix.

Note: CLP RAS analysis following SOW/ILM3.0 or most current version.

3.2 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSIS

The fundamental QA objective with respect to accuracy, precision, and sensitivity (see glossary of terms for definitions, Section 15.0) of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols. The accuracy and precision requirements for CLP RAS analysis are specified in the current SOW OLM03.0 for organic analysis (low-medium concentration) and the current SOW ILM03.0 (9/91) for inorganic analysis (low-medium concentration) or the most current version. The sensitivities required for CLP analyses will be the method detection limits shown in Tables 3-1 through 3-4, from the cited SOWs.

Data from field measurements will be assessed by thorough review of QC data (calibrations, standards, blanks, and replicates as discussed in Section 3.4), documentation that analytical procedures were adhered to, and reports from system audits.

3.3 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

It is expected that the CLP will provide data meeting QC acceptance criteria for 95 percent or more of all samples tested. Analytical data from the CLP is assessed for contractual completeness by the Sample Management Office according to their contract compliance screening procedure before the data is sent to the CDM project organization. The data is then reviewed for precision, accuracy, and completeness in accordance with the procedures described in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, 2/94 and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, 2/94. CLP laboratory should provide data that are complete and valid. The screening level volatile organic data will be reviewed in the field and is expected to provide data that is 90% complete. All field data will be reviewed for completeness by the principal investigator. (For definitions of completeness,

representativeness and comparability, see Section 15, Glossary of Terms). This SCOU investigation has been designed to provide sufficient data to achieve the project objectives (subsection 1.2).

The sampling network was designed to provide data representative of site conditions. To achieve the goal of obtaining representative site data the standard operating procedures described in this QAPP addendum and SAP will be adhered to during the project. During development of this sampling network, consideration was given to past waste disposal practices, existing analytical data, physical setting and processes. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data, as documented in this QAPP addendum, are expected to provide data that will be comparable to the data collected in the Phase I and Phase II studies of this investigation. This will be achieved by using CLP RAS/ analytical protocols, QA/QC, and reporting.

3.4 FIELD MEASUREMENTS

Measurement data will be generated in many field activities that are incidental to collecting samples for analytical testing or unrelated to sampling. These activities include, but are not limited to, the following:

- Documenting time and weather conditions;
- Locating and determining the elevation of sampling stations;
- Determining pH and temperature of water supply;

- Determining depths in a borehole; and
- Indoor and ambient air sampling.

The general QC objective for such measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the intended use of the data through the documented use of standardized procedures. The procedures for performing these activities and the standardized formats for documenting them are presented in the SAP.

Completeness, representativeness and comparability (defined in Section 15.0) are discussed below and are addressed in the analytical field procedures (Appendix B). The completeness for analytical field results for this phase will be 90% or better. Representative field data will be obtained by performing all field sampling and field measurements in a standardized manner by strictly adhering to the procedures specified in this QAPP addendum and in the SAP and Work Plan. Qualitative comparability will be achieved by following QA/QC sampling and analytical procedures outlined in the QAPP addendum, SAP and Work Plan.

The precision and accuracy of pH measurements will be assessed in the field prior to analysis. The calibration of the pH meter will be conducted at the beginning of the day prior to use. The calibration of the pH meter (Appendix B) will be performed by taking two measurements on each of two standard buffer solutions of pH 4 and pH 7. The accuracy will be determined by the difference in replicate samples of the standard pH buffer solutions. These measurements should be within ± 0.1 pH units from the value of the standard solutions. Replicate analysis will be completed on both standards and the difference between the replicates will be within ± 0.1 standard pH units of the known value of the standard buffer solution. The precision will be less than or equal to 0.1 difference between the two

measurements on each pH standard buffer solution. If the pH meter fails to calibrate properly, a different pH meter will be calibrated and used.

The calibration measurements made for the specific conductance will be used to assess the accuracy and precision of the instrument used. The calibration of the instrument will be made by making two measurements on a standard. The standard used will be a solution of 0.01 demol KCl. The accuracy will be within 10% of the standard value and precision will be less than or equal to 15% of the difference between the two replicate measurements of the standard. If the measurements are not within $\pm 10\%$ of the standard or are not reproducible within $\pm 15\%$, the instruments will be returned to the manufacturer for maintenance and calibration.

The calibration procedures for the HNu are outlined in Appendix B. The HNu will be calibrated after each field use or prior to each field use if the instrument has not been calibrated during the previous 14 calendar days. Isobutylene will be used as the standard. The instrument will be calibrated in the 0-20 ppm range and the 20-200 ppm range. If the instrument measurements are not within $\pm 15\%$ of the known standard in either of the two calibration ranges, the instrument will be sent back to the manufacturer for maintenance and calibration.

The calibration procedures for the Organic Vapor Analyzer (OVA) are outlined in Appendix B. This instrument will be calibrated after each field use or prior to each field use if the instrument has not been calibrated during the previous 14 calendar days. The manufacturer calibrates the OVA with methane at the factory. The minimum detection limit for methane is 0.2 ppm. For precise analysis, it is necessary to recalibrate with the specific compound of interest. A commercially available standard will be used if it is necessary to recalibrate for a specific compound. If the instrument is not within $\pm 15\%$ of the standard, the instrument

will be sent back to the manufacturer to be recalibrated.

The level of QC for the thermometer will consist of a calibration check using an ice/water slurry once at the beginning of field activities. The thermometer must read $\pm 0.5^{\circ}$ C. If the thermometer is out of calibration, it will be replaced.

4.0 SAMPLING PROCEDURES

Sampling procedures are provided in the Sampling and Analysis Plan.

5.0 SAMPLE CUSTODY

5.1 INTRODUCTION

The subsection does not change from that provided in the Southeast Rockford Groundwater Contamination QAPP, March 1993, Section 5.1, page 5-1.

5.2 FIELD-SPECIFIC CUSTODY PROCEDURES

This subsection does not change from that provided in the Southeast Rockford Groundwater Contamination QAPP, March 1993, Section 5.2, page 5-1.

5.3 LABORATORY CUSTODY PROCEDURES

Laboratories that are in the CLP will follow the sample custody procedures specified in the current CLP SOW OLM03.1 for low-medium concentration organic analysis and the current CLP SOW ILM03.0 for inorganic low-medium concentration analysis or most current versions. These custody procedures along with the holding time requirements for CLP samples are described in the appropriate SOW documents. The custody procedures for the soil gas analyses are detailed in Appendix A.

5.4 FINAL EVIDENCE FILES CUSTODY PROCEDURES

For all samples analyzed under CLP SOWs OLM03.1, or ILM03.0, the CLP laboratories will submit all original documents to USEPA Region V within 35 days of receipt of last sample

for the case. The Superfund Division Technical Support (TSS) will be responsible for the final evidence audit of these files and their secure storage.

The contractor will maintain the site files along with all relevant records, reports, logs, field notebooks, pictures, subcontractor reports and the data and data reviews of the CLP and screening level generated laboratory data in a limited access area and under custody of the contractor's Site Manager.

The final evidence file will include, but not be limited to:

Project Plans
Field Data Records
Logbooks

Graphs
Calculations

Sample Tags
Chain-of-Custody Records
Sample Tracking Records
Analytical Logbook Pages
Bench Sheets
Instrument Readout Records
Computer Printouts

Raw Data Summaries
Data/Purge Files
Correspondence
Data Validation Files and Reports
Report Notes
Miscellaneous-Photos, Maps, Drawings,
etc.
Final Report

6.0 CALIBRATION PROCEDURES AND FREQUENCIES

As an activity which affects data quality, instrument calibration must be done in accordance with formal written procedures. The calibration procedures for CLP RAS analyses are provided in the current EPA CLP SOW OLM03.1 for low-medium concentration organics and the current SOW ILM03.0 for low-medium concentration inorganics or most current versions. Calibration procedures for the soil gas screening level volatile organic analysis are provided in Appendix A. General requirements for the calibration of instruments are established in the calibration procedures provided in Appendix B. The instrument must be calibrated and maintained by trained personnel to operate within manufacturer's specifications. Field instruments will be calibrated prior to any measurements in the field. Calibration procedures for field instruments are provided in Appendix B. Field instruments will be recalibrated if found to be necessary by performance of QC checks.

Standard Operating Procedures for field and laboratory instruments are described in Section 12.

The Standard Operating Procedures for field instrument calibration to be used during the Southeast Rockford SCOU (Appendix B) are detailed in the CDM Site Investigation Procedures Manual (SIPM). These procedures are listed below:

<u>Procedure Title</u>	<u>SIPM Method No.</u>
• Equipment and Instrument Calibration and Maintenance, General	6600001
• Calibration and Maintenance Procedure YSI Model 33 SCT Meter	6617002

<u>Procedure Title</u>	<u>SIPM Method No.</u>
• Calibration and Maintenance Procedures HaakeBuchler pH Stick	6617003
• Calibration Procedure for the HNu PS 101	6607001
• Calibration and Maintenance Procedure Century Systems Portable Organic Vapor Analyzer Model OVA-128	6607003

The calibration for the thermometer will be performed by using an ice/water slurry to check for accuracy. The thermometer shall be within $\pm 0.5^{\circ}$ of 0°C when the thermometer has equilibrated with the ice/water slurry.

All calibration performed in the field will be documented in the field logbook.

7.0 ANALYTICAL PROCEDURES

For the Southeast Rockford SCOU, the analytical procedures for the CLP Laboratory are specified in the current USEPA CLP SOW OLM03.1 for RAS low-medium concentration organic analyses, in the current CLP SOW ILM03.0 for RAS low-medium concentration inorganic analyses or most current versions. The analytical method to be used for field screening for soil gas is provided in Appendix A.

Analytical procedures for field analytical equipment are discussed in the Sampling and Analysis Plan.

Standard analytical procedures for field and laboratory analytical equipment are discussed in Section 12.

8.0 INTERNAL QUALITY CONTROL CHECKS

Internal quality control checks for field instruments are discussed in Section 3.4. Quality control procedures for field measurements are limited to checking the reproducibility of the measurement by obtaining multiple readings and/or by calibrating the instruments (where appropriate). When any field instrument fails the QC checks for calibration it will be re-calibrated, repaired, or replaced, whichever is necessary. Quality control of field sampling will involve collecting field duplicates and blanks in accordance with the applicable procedures described in the SAP.

Internal quality control procedures for RAS from the CLP are specified in the current SOW OLM03.1 for organics and the current SOW ILM03.0 for inorganics as well as in the method descriptions. The quality control checks for laboratory instrumentation are discussed in Section 3.2. These specifications include the types of audits required (sample spikes, surrogate spikes, reference samples, controls, blanks), the frequency of each audit, the compounds to be used for sample spikes and surrogate spikes, and the quality control acceptance criteria for these audits.

The level of interval quality control for the field screening of volatile organics in soil gas is provided in Appendix A.

9.0 DATA REDUCTION, VALIDATION AND REPORTING

Data reduction, evaluation and reporting of those samples analyzed by CLP laboratories will be performed in accordance with the specifications of the USEPA Contract Laboratory Program. The data management approach for CLP-analyzed samples is illustrated with the logic diagram shown in Figure 9-1. Data reduction for RAS analytical services performed by USEPA CLP will be in accordance with current CLP Statements of Work (SOW) for organics and inorganics. Data reporting for RAS analytical services will be in accordance with current CLP Statements of Work (SOW).

Data reduction for RAS analytical services at the USEPA CLP will be in accordance with the current CLP Laboratory Statement of Work (SOW). The data will be assessed by verification of the reduction results and confirmation of compliance with QA/QC requirements.

The analytical data from the field screening of soil gas for volatile organics analysis will be evaluated for accuracy precision and completeness in the field. The data will be assessed by reviewing field and laboratory duplicates and blanks and the results will be summarized in the report.

Raw data from field measurements and sample collection activities will be appropriately recorded in the field log book. If the data is to be used in the project reports, it will be reduced or summarized and the method of reduction documented in the report.

The CLP RAS analytical data will be validated by USEPA CASS personnel to ensure that the data is sufficient to support the risk assessment and the feasibility study. The data validation procedures are provided in two USEPA documents. These documents are: USEPA Contract

Figure 9-1

Laboratory Program National Functional Guidelines for Organic Data Review, 2/94; and
USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses Data Review,
2/94.

10.0 PERFORMANCE AND SYSTEMS AUDITS

Performance and systems audits may be conducted for activities performed by any entity performing services on this project, including CLP laboratories and field team activities.

Performance and systems audits of field activities may be performed periodically by the CDM QA Manager in accordance with CDM audit procedures, the USEPA Region V Environmental Services Division or the IEPA Project Manager. Audits will be performed to evaluate sampling activities including sample ID, chain-of-custody, field documentation and proper sampling procedures. The results of the field audits will be reported as part of the Quality Assurance Reports to management.

The performance and systems audits of the USEPA CLP Laboratory are the responsibility of USEPA EMSL-LV. Performance audits are used to evaluate laboratory performance. These audits consist of random data audits, continuous trend analyses of laboratory quality control data and quarterly analysis of performance evaluation (PE) samples. Systems audits are performed to verify continuity of personnel, instrumentation and quality control requirements contained in the IFBs. Systems audits are performed by ESML - Las Vegas and consist of annual on-site inspections.

No audits are planned for the on-site soil gas GC.

11.0 PREVENTIVE MAINTENANCE

All laboratories participating in the CLP are required under respective SOWs for organics and inorganics to have Standard Operating Procedures (SOPs) for preventive maintenance for each measurement system and required support activity. All maintenance activity must be documented in logbooks to provide a history of maintenance records. The preventive maintenance program for the soil gas subcontractor, is described in Appendix A.

The field equipment to be used for this project includes field pH meters, conductivity meters and thermometers. Preventive maintenance of field analytical equipment used at Southeast Rockford will be conducted in accordance with the maintenance procedures outlined in the Standard Operating Procedures provided in Appendix B. Specific preventive maintenance procedures for this equipment are referenced in the SAP. The Field Manager will be responsible for implementing these procedures, documenting the procedures carried out in the logbook and on the proper forms.

12.0 ANALYTICAL SERVICES

General requirements for analytical procedures are established in the CLP Quality Assurance Programs. These programs establish the need for formally documented procedures which require:

- The use of CLP laboratories and analytical procedures for all enforcement, litigation, and evidentiary data,
- The specification of analytical procedures for all analytical field procedures and non-CLP generated data.

12.1 ROUTINE ANALYTICAL SERVICES LABORATORY PROCEDURES

The current USEPA Contract Laboratory Program Statement of Work (SOW) for organics and the SOW for inorganics specify the analytical procedures to be used for performing the requested organic and inorganic analyses on the soil and water samples collected during the Southeast Rockford SCOU. Also specified by the SOWs are the sample custody procedures, instrument calibration procedures and frequency of calibration.

12.2 SPECIAL ANALYTICAL SERVICES LABORATORY PROCEDURES

No special analytical services will be used for the SCOU.

12.3 SCREENING LEVEL SERVICES LABORATORY PROCEDURES

The analytical procedure to be used for performing the screening level soil gas volatile organic analysis is described in Appendix A of the QAPP addendum.

12.4 FIELD SCREENING ANALYTICAL PROCEDURES

For field screening analyses, the relevant SOPs are found in the CDM Site Investigation Procedures Manual as follows:

<u>Procedure Title</u>	<u>SIPM Method No.</u>
• Operation Procedure YSI Model 33 SCT Meter	5617002
• Operation Procedure for HaakeBuchler pH Stick	5617003
• Procedure for Determining Temperature of Surface	5617004
• Operation procedure for HNu Model PS 101 photoionization analyzer	5607001
• Operation procedure for Century portable organic vapor analyzer model OVA-128	5607003

All procedures used and results obtained will be documented in the field logbook.

13.0 CORRECTIVE ACTION

Corrective action for the CLP is implemented at several different levels. The laboratories participating in the CLP are required to have a written SOP specifying corrective action to be taken when an analytical error is discovered or the analytical system is determined to be out of control. The SOP requires documentation of the corrective action and notification to the analyst of the error and correct procedures.

During field operations including the screening of soil gas for VOCs analysis, if any nonconformance with established quality control procedures is identified, the Project Manager will be responsible for developing and initiating corrective action. The IEPA Project Manager will be responsible for reporting any proposed, developed or initiated corrective actions to the USEPA Region V Project Officer for review and approval. Corrective action needed for on-site activities will be initiated by the field team leader, but must be approved by the Project Manager.

14.0 QUALITY ASSURANCE REPORTS TO THE MANAGEMENT

The QA reports will be a part of the regular quarterly project reports that the IEPA submits to the USEPA Region V RPM. The QA reports will contain (but not be limited to) project status, results of performance and systems audits, data quality assessments, quality assurance problems with proposed corrective actions and QAPP amendments.

15.0 GLOSSARY OF TERMS

ACCURACY - The degree of agreement of a measurement (or an average of measurements of the same thing), X , with an accepted referenced or true value, T , usually expressed as the difference between the two values, $X-T$, or the difference as a percentage of the reference or true value, $100 (X-T)/T$, and sometimes expressed as a ratio, X/T . Accuracy is a measure of the bias in a system.

AUDIT - A systematic check to determine the quality of operation of some function or activity. Audits may be of two basic types: (1) system audits that consist of a review of the quality control system to ensure that a comprehensive set of quality control methods, procedures, reviews, and signoff approvals is established or in place, and (2) performance audits in which project activities are observed in process for their compliance with the established quality control procedures and requirements.

COMPARABILITY - Expresses the qualitative confidence with which one data set can be compared to another. For this project, the data comparability will be achieved by the following:

- a. Analytical results will be reported in appropriate units;
- b. Same or similar sampling procedures used in previous investigations will be used; and
- c. Quality assurance and quality control requirements will be observed.

COMPLETENESS - A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions to characterize the environmental condition and/or the amount of valid data obtained from the measurements system compared with the amount of data that was expected under normal conditions. Percent completeness is defined as:

$$\frac{(\text{number of valid data})}{(\text{number of samples collected for each parameter analyzed})} \times 100$$

DATA VALIDATION - A systematic process for reviewing a body of data against a set of criteria to provide assurance that the data are adequate for their intended use. Data validation consists of data editing, screening, checking, auditing, verification, certification, and review.

PRECISION - A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist depending upon the "prescribed similar conditions".

QUALITY ASSURANCE - The total integrated program for assuring the reliability of monitoring and measurement data. A system for integrating the quality planning, quality assessment, and quality improvement effort to meet user requirements.

QUALITY ASSURANCE PROGRAM PLAN - An orderly assemblage of management policies, objectives, principles, and general procedures by which an agency or laboratory outlines how it intends to produce data of known and accepted quality.

QUALITY ASSURANCE PROJECT PLAN - An orderly assemblage of detailed and specific procedures which delineates how data of known and accepted quality are produced for a specific project. (A given agency or laboratory would have only one quality assurance program plan, but would have a quality assurance project plan for each of its projects.)

QUALITY CONTROL - The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

REPRESENTATIVENESS - A qualitative measure of the degree to which the data accurately and precisely represents a characteristic of a population, parameter variation at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative criteria which is associated with the proper design of a sampling and analysis program.

STANDARD OPERATING PROCEDURE - A written document which details an operation, analysis, or action whose mechanisms are thoroughly prescribed and which is commonly accepted as the method for performing certain routine or repetitive tasks.

Southeast Rockford SCOU
QAPP Addendum
Section No. TOC
Revision No. 1
Date January 22, 1996
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APPENDIX A
STANDARD OPERATING PROCEDURES FOR SOIL GAS SAMPLE COLLECTION AND
ANALYSIS

DRAFT
SCOPE OF WORK/QUALITY ASSURANCE PROJECT PLAN
FOR
SOIL GAS/GROUNDWATER INVESTIGATION
AT THE
SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION SITE
ROCKFORD, ILLINOIS

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August 4, 1995

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1.0 INTRODUCTION

From the Scope of Work for Soil Gas and Groundwater Collection at the Southeast Rockford Groundwater Contamination Site it is understood that TERRA-TRACE Environmental Services (TERRA-TRACE) is responsible for the following:

- Advance approximately 324 soil gas probes and collect soil gas from all locations and collect two soil samples from approximately 81 locations with the Geoprobe system during the investigation of the four main areas of the site.
- Submittal of their Standard Operating Procedure included in the project specific quality assurance plan for review and approval by IDEM and USEPA, Region V.
- A minimum of a two person team will perform the soil gas survey consisting of a Geoprobe operator and a chromatography technician.

The subcontractor shall perform soil gas surveys and collect soil samples at four locations of the site in Rockford, Illinois. All soil gas samples will be analyzed for a specific group of volatile organic compounds including total 1,2-Dichloroethane (1,2-DCE), 1,1,1-Trichloroethane (1,1,1-TCA), Vinyl Chloride, Tetrachloroethene (PCE), Trichloroethene (TCE), and 1,1-Dichloroethane (1,1-DCA). In addition to these parameters, soil gas samples collected in Area 11 will also be analyzed for benzene, ethylbenzene, toluene, and xylenes. All of the soil gas samples will be collected at thirty-five feet or less below grade. Sampling is expected to proceed at a minimum rate of 10 to 15 samples per day.

2.0 SURVEY LOCATIONS AND PLACEMENT

CDM will be responsible for staking and utility clearance of all of the soil gas locations. A limit of three attempts will be made at each grid point to collect a soil gas sample. The first attempt will be made directly at the marked grid point. If probe refusal occurs, the subsequent attempts will be made within a 10 foot radius of the first point. In areas where utilities are marked or are obviously apparent, movement may be limited around the original marked grid point. If all three attempts to collect a soil gas sample at a grid location fail, the soil gas crew will move to the next location along the grid as directed by CDM. Actual grid points may be adjusted once in the field because of access agreements, utilities, and unidentified buildings.

3.0 SURVEY PROCEDURES

The soil gas samples will be collected using the Post Run Tubing (PRT) system that utilizes a hollow metal probe driven into the ground with an expendable point using the Geoprobe system. The leading hollow probe rod is fitted with an expendable point holder and an expendable point then driven to the desired sampling interval. The expendable point holder has a left-hand female threaded opening that accepts an aluminum left-hand threaded tubing adaptor. A required length of 1/4-inch O.D. polyethylene tubing is fitted to the hollow tubing adaptor. The tubing and adaptor are lowered down inside of the probe rods and threaded into the expneadble point holder. To assure an air tight seal is maintained, a rubber o-ring is placed between the tubing adaptor and the expendable point holder. As the probe rod string is pulled up a few inches it exposes a cavity of soil from which a representative soil gas sample can be collected. The tubing and cavity are purged of three volumes using a vacuum pump at the surface. A vacuum chamber fitted with a pre-sterilized 0.5 liter Tedlar bag is connected to the sample tubing and evacuated generating negative pressure inside the chamber allowing the bag to fill with soil gas. Soil gas samples should never contact potentially sorbing materials. Soil gas samples will be collected in this manner at five areas of the site. The Tedlar bags will be sub-sampled by a sterilized glass syringe to accommodate analytical volume requirements. The sample will then be injected into the gas chromatograph for analysis. More than two injections may be necessary where there are multiple contaminants that required different sample sizes for chromatograph analysis.

During the investigation, approximately 25% of the soil gas sampling locations will have two soil samples collected (81 locations, 162 soil samples). The soil samples will be collected from an average depth of 20 feet using the Geoprobe system. Acetate sleeves will be used in the soil collection tool to contain the soil samples. After the soil samples have been collected the acetate sleeve will be cut and the soil sample will be transferred to an unpreserved, clean, USEPA CLP approved container for analysis by a USEPA CLP laboratory.

After the samples have been collected and the probe removed from the ground, the remaining open hole will be backfilled with granular bentonite to six inches below grade and an asphalt or concrete patch will be used to restore the area to pre-investigation conditions.

4.0 INSTRUMENTATION AND MATERIALS

4.1 Sampling Equipment

- Geoprobe hydraulic soil probe machine
- Pace American 14'x7' tandem axle enclosed trailer for storage and repair or preparation of sampling equipment
- 3500 watt gasoline powered generator
- ~ 40 feet of 1.25-inch O.D. X 0.5-inch I.D. steel probe rods
- Various Geoprobe tools including PRT and RSP fittings\hand tools\concrete bit and drill steel
- Piston-type soil sampler and acetate sample sleeves
- Safety equipment: first aid kit, fire and hazardous chemical protection
- Vacuum/volume vacuum purge pump
- SKC Vac-U-Chamber soil gas collection box
- air sampling pump
- a peristaltic and inertia pump and stainless steel mini-bailer for groundwater sampling
- Personal protective equipment for Level D and Level C
- Polyethylene or teflon and silicon tubing
- 0.5 liter Tedlar sample bags

4.2 Gas Chromatograph Equipment

- Wells Cargo 10'x7' mobile lab trailer
- 4000 watt gasoline powered generator
- One SRI Model 8610 gas chromatograph
- Purge and trap - SRI model 8690-0051
- Detectors - Photoionization Detector (PID) in series with Electrolytic Conductivity Detector (ELCD)
- Column - RTX-624 fused silica capillary column
- Traps - Supelco, Vocab 3000
- Data system - Peaksimple III
- Glass syringes - 1 ul, 5 ul, 10 ul, 100 ul, 1 ml, 10 ml, 50 ml, 100 ml
- Personal computer and printer
- Gas cylinders containing compressed nitrogen and air
- 40 ml VOA vials for chemical standards
- Various fittings and tools required for normal operation

5.0 ANALYTICAL CHEMISTRY PROCEDURES

5.1 Method

Volatile organic compounds (VOCs) consisting of halogenated and aromatic compounds will be detected in soil gas samples analyzed using a gas chromatograph with a concentrated trap (modified method 5030). A temperature program is used with the gas chromatograph to separate the organic compounds identified by retention time. Detection of compounds is achieved by Electrolytic Conductivity Detector (ELCD) and a Photo-Ionization Detector (PID).

Quantification of compounds is achieved by comparison of the detector response of the sample with the response measured for the calibration standards. Instrument calibration checks will be run periodically throughout the day as are system blanks to check for contamination in the sampling equipment. Ambient air samples will be analyzed to determine background levels in the atmosphere.

5.2 Checks for Contamination

Microliter syringes will be checked for contamination prior to sampling each day by injecting nitrogen carrier gas into the gas chromatograph. Syringes will be reused only after a nitrogen carrier gas blank has been run to insure there is no contamination from previous sampling.

A system or method blank is drawn through randomly selected probe rods and post run tubing fittings with tubing into a tedlar bag. An aliquote sample of this blank is analyzed to determine the presence of contamination in the sampling equipment. Method blanks will be run prior to calibration and analyzing of samples. Method blanks will be run after calibration checks and after highly contaminated samples to insure that column/trap carry over does not occur.

5.3 Analytical Equipment Calibration

At the beginning of each day, standards of total 1,2-Dichloroethane (1,2-DCE), 1,1,1-Trichloroethane (TCA), Vinyl Chloride, Tetrachloroethene (PCE), Trichloroethene (TCE) and 1,1-Dichloroethane (1,1-DCA) will be analyzed to calibrate the gas chromatograph and determine the daily response factors. When investigating Area 11, benzene, ethylbenzene, toluene, and xylenes will also be analyzed. Prior to running standards, water for standards will be analyzed for purity. Stock chemical standards that come pre-made in methanol will be used for calibration. At least three standard injections will be analyzed until resultant responses fall within 25% of each other. The three standard injections will be run after every five samples.

5.4 Analytical Procedures

Soil gas samples will be collected in 0.5 liter tedlar bags equipped with a sept-port. Sub-sampling syringes (10 cc or greater) will be used to draw a 5 cc aliquote of sample from the tedlar bag. Samples are introduced into the analytical system via a gas tight syringe directly onto the trap. Using a dedicated 50 ul syringe, inject onto the trap the surrogate at a concentration of 20 ppb. Injection volume is varied to insure that resultant masses of analyte fall within the linear response range of the daily standards. All sub-sampling syringes and needles will be used only once before decontamination. Tedlar bags will only be used once.

5.5 Detection Limits

Detection limits are a function of the injection volume as well as the detector sensitivity for individual compounds. Thus the detection limit varies with sample size. Generally, the larger the injection size, the greater the sensitivity. However, peaks for compounds of interest must be kept within the linear range of the detector. If any compound has a high concentration such that it is out of range, it may be necessary to use small injections, and in some cases to dilute the sample to keep it within the linear range. This may cause decreased detection limits for other compounds in the analyses. The detection limit for the compounds to be analyzed is 1 ug/l. If any compound being analyzed is not detected, the detection limit for that compound in that analysis is given as a "less than" value (e.g. <1 ug/l). This number is calculated from the the current response factor, the sample size, and the estimated minimum peak size (area) that would have been visible under the conditions of the measurement. Table 1 lists the applicable detection limits for various compounds in soil gas using direct injection techniques.

6.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

6.1 Probe Tools

All steel probe rods and down-hole sampling tools will be decontaminated before collection of any soil gas or soil samples. Post run tubing (PRT) adaptors will be cleaned after each sample and at the end of each day by baking them in the GC oven. The piston sampler fittings will be decontaminated before and after each use. System blanks and rinsate blanks will be collected after every five samples and at the beginning of each day.

6.2 Sample Tubing

Silicon and polyethylene or teflon tubing is to be used only once per sample and then discarded after use to prevent cross-contamination between samples.

6.3 Tedlar Bags

Tedlar bags are received from the supplier contaminant-free. They will be used for only one sample and then discarded.

6.4 Septa

Septa through which soil gas samples are injected into the gas chromatograph are replaced on a daily basis to prevent possible leaks from the chromatographic column.

6.5 Analytical Instruments

Analytical instruments will be calibrated each day by the use of stock chemical standards prepared in methanol. Calibration checks will also be run after approximately every five soil gas sampling locations.

6.6 Sampling Syringes

All sampling syringes will be decontaminated before and after each sample and checked for contamination prior to sampling each day by injecting nitrogen carrier gas into the gas chromatograph.

6.7 System Blanks

Prior to sampling, each day, system blanks will be run to check the sampling apparatus (PRT system components and syringe) for contamination by drawing ambient air from above ground through the system and comparing the analysis to a currently sampled air analysis.

6.8 Rinsate Blanks

Rinsate blanks will be collected from the soil sampling equipment after every five samples and at the beginning of each day, if necessary. Rinsates will consist of distilled and deionized laboratory grade water.

6.9 Soil Gas Pumping

Soil gas pumping will be monitored by a vacuum guage to insure that an adequate gas flow from the vadose zone is maintained. A negative pressure (vacuum) of 2-inches of Hg less than the maximum capacity of the pump (evacuation rate >0.02 cfm) usually indicates that a reliable gas sample cannot be obtained because the soil has very low air permeability.

7.0 DOCUMENTATION

TERRA-TRACE will maintain a complete, accurate, chronological log of all activities regarding the soil gas survey as the investigation progresses. The field log shall be kept in a bound book containing no other information but this project. Each page of the field log will be numbered, dated, and show the initials of all crew members. All entries shall be made in ink and no erasures made. Incorrect entries shall be crossed out with a single strike mark and initials of the person making the correction shall be written adjacent to the mark. Upon completion of field work, all field log books, relevant notes, computations, and pertinent reference materials shall be relinquished.

Appendices

APPENDIX A
DRAFT
SOIL GAS SAMPLING PROCEDURES

<u>PROCEDURE</u>	<u>TITLE</u>
SG-1	SOIL GAS SAMPLING - POST RUN TUBING (PRT) SYSTEM OPERATION

PREPARED BY _____ APPROVED BY _____

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FIELD PROCEDURE NO. SG-1

SOIL GAS SAMPLING - POST RUN TUBING (PRT) SYSTEM OPERATION

SUMMARY OF METHOD:

Soil gas samples are collected using a temporary "grab" (one-time) sample method referred to as the Post Run Tubing (PRT) method (refer to Attachment 1 for description). The PRT system is used to collect soil gas samples from discrete depths within the soil vadose zone. The method uses 1-inch O.D. X 0.5-inch I.D. percussion driven hollow steel threaded probe rods with a threaded expendable point holder to collect soil gas samples. The probe rods and expendable drive point are driven to depth using a hydraulic soil probe machine. If the surface material consists of concrete or asphalt, a 1.5-inch diameter carbide-tipped concrete bit is used to hammer through the pavement using the hydraulic soil probe hammer. After the rods and drive point have been driven to the required sampling depth the rods are retracted a few inches leaving behind the expendable steel drive point and a column of soil is exposed for vapor sampling. A length of 1/4-inch O.D. polyethylene tubing connected to an aluminum barbed fitting that contains an o-ring is threaded into the expendable point holder. The tubing is rotated clockwise from above to thread the barbed fitting into the female threaded expendable point at the base of the probe rods. The polyethylene tubing is connected to a vacuum pump with silicon tubing at the surface that will be used to purge three to five (3-5) volumes of soil gas from the PRT system tubing. The vacuum pump is fitted with a vacuum pressure guage to assure that there is no impedance to gas flow caused by low-permeability or water-saturated soils.

Once the system has been purged, a vacuum chamber box fitted with an empty 0.5 liter tedlar bag is hooked up to the PRT system tubing. A vacuum pump is connected to the outside of the vacuum chamber box and a vacuum is applied inside the box creating negative pressure inside of the box and tedlar bag. The air inlet port that is connected to the tedlar bag is opened from outside the box allowing soil gas to be drawn into the bag. The vacuum chamber box contains a clear glass viewing window to allow the sampler to determine when to close the inlet port after the bag has been inflated with the sample and not overfilled. The chamber box can be opened and the sealed tedlar bag with the sample can be withdrawn for lab analysis.

The 0.5 liter soil gas sample is collected from each sampling probe within one minute of purging. The sample is subsampled according to analytical requirements and replicates are injected into the gas chromatograph for documentation of reproducibility. More than two injections may be necessary where there are multiple contaminants that require different sample volumes for chromatographic analysis.

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After the soil gas sample has been collected the expendable point remains in the soil and the probe rods are removed from the ground and the hole is sealed with granular bentonite. Asphalt or concrete patch is used to cap holes that have been created through paved or concrete areas.

SUPPLIES:

- Hydraulic soil probe machine
- 14'X7' enclosed Pace American support trailer
- 3500 watt gasoline powered generator
- ~ 40 feet of 1-inch diameter steel probe rods with an expendable point holder
- 1.25-inch diameter steel expendable drive points
- miscellaneous hand and probe tools
- 1.5-inch diameter carbide-tipped bit and drill steel
- required lengths of 1/4-inch I.D. silicon and 1/4-inch O. D. polyethylene tubing
- vacuum chamber box with vacuum port and sample port
- vacuum pump with pressure and volume guage
- Tedlar bags (0.5 liter) with septa port
- 50 ul, 1 ml, 10 ml glass syringes
- granular bentonite
- asphalt and concrete patch material

PROCEDURE

1. Determination of Sampling Locations:

1.1 Initial sampling locations will be determined by the client (CDM) prior to the start of the project.

1.2 Remaining sample locations may be determined by the following:

1.2.1 Client:

1.2.1.1 All sampling locations set up on a marked grid system.

1.2.1.2 Client decides location of remaining sampling locations based on results of initial study.

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1.2.2. Client and TERRA-TRACE Personnel:

1.2.2.1. Client and TERRA-TRACE personnel decide location of remaining sampling locations based on results of initial sampling locations.

2. Checks for Sampling System Contamination:

2.1 Prior to use, a sub-sampling syringe is blanked to determine if contamination exists in the syringes (Landmark Procedure GC103a - Appendix B).

2.2 Prior to sample probe placement, an ambient air sample is drawn above ground in the vicinity of the sampling area.

2.3 Concurrently, a system blank will be drawn through randomly selected probe tools and PRT fittings into a tedlar bag and analyzed using the analytical system.

2.4 The results of the ambient air and system blank samples are compared to determine the presence of contamination in the sampling apparatus.

3. Sampling Probe Placement

3.1 The hydraulic soil probe is located over the sampling location and the probe mast is unfolded centered vertically over the sample location.

3.2 If concrete or asphalt are present a concrete bit and drill steel are connected to the probe hammer to penetrate the surface pavement.

3.3 Precleaned sample probe rods and PRT fittings are removed from storage and an expendable drive point is fitted to the end of the probe rods.

3.4 A drive cap is fitted to the top of the probe rods and the rods are pushed and driven into the soil to the required sampling depth.

3.5 A pull cap is fitted to the top of the probe rods and the rods are extracted approximately 6-inches leaving the expendable point behind and exposing a cavity of soil for sampling.

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4. Soil Gas Sample Collection

4.1 An aluminum barbed PRT fitting containing an o-ring is connected to a required length of 1/4-inch O.D. polyethylene tubing.

4.2 The tubing and PRT fitting are lowered down the inside of the hollow probe rods and rotated clockwise to thread the PRT fitting into the top of the expendable point holder.

4.3 At the surface, the polyethylene tubing is connected to a vacuum pump with silicon tubing at the surface that will be used to purge three to five (3-5) volumes of soil gas from the PRT system tubing and soil cavity. The vacuum pump is fitted with a vacuum pressure and air volume gauge to assure that there is no impedance to gas flow caused by low-permeability or water-saturated soils.

4.4 The vacuum pump is turned on and evacuates a separate closed vacuum cylinder with a pressure up to 27-inches of mercury. Once the cylinder is pressurized an initial reading of both pressure in inches of mercury and volume in liters of air are taken directly from the pressure/volume gauge prior to opening the cylinder valve. If after applying a vacuum to the PRT system no response is seen on the gauge then the probe rods must be pulled up incrementally until a sample can be collected. If the rods have to be pulled back then repeat steps 4.2 through 4.4.

5. Sample Collection

5.1 Once the PRT system has been purged, a vacuum chamber box fitted with an empty 0.5 liter tedlar bag is hooked up to the PRT system tubing. The 0.5 liter soil gas sample is collected from each sampling probe within one minute of purging.

5.2 A personal sampling vacuum pump set at between 1 to 5 liters/min. is connected to the outside of the vacuum chamber box port with silicon tubing to evacuate air from the inside of the box creating negative pressure inside of the box and tedlar bag.

5.3 The air inlet port, that is connected to the tedlar bag which is in a negative pressure atmosphere, is opened from outside the box allowing soil gas to be drawn into the bag. The vacuum chamber box contains a clear glass viewing window to allow the sampler to determine when to close the inlet port after the bag has been inflated with the sample so as not to overfill and explode the bag.

5.4 The chamber box can be opened and the sealed tedlar bag with the sample can be withdrawn for lab analysis.

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5.5 The sample is subsampled according to analytical requirements and replicates are injected into the gas chromatograph for documentation of reproducibility. More than two injections may be necessary where there are multiple contaminants that require different sample volumes for chromatographic analysis.

6. Sampling Log Book and Documentation

6.1 A separate hard bound water proof notebook will kept with the TERRA-TRACE sampling team to record all necessary information during sampling events.

6.2 The notebook will include the date and time (in military notation) of each event, the names of sampling personnel, and a daily summary of activities for each day of sampling.

6.3 Individual sample collection data sheets will be filled for each sample collected. This information will be included in the summary Sampling Data Table and will include the following information:

6.3.1 Time (Military notation).

6.3.2 Sample Number (use "SG-" prefix or client's numbering system, whichever was established at the beginning of the project).

6.3.3 Sampling Depth in feet.

6.3.4 Purge pressure and volume.

6.3.5 Purge evacuation time in seconds.

6.3.6 Sample volume collected (cc)

6.3.7 Number of attempts (borings) and drive points used.

6.3.8 Notes and any additional information requested by the client. This includes but is not limited to; description of the sampling location and general area, weather conditions, ground conditions, asphalt, concrete, soil appearance, surface water, odors, vegetation, backfill procedures and materials, etc.

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7. Other Record Keeping:

7.1 Client-provided data sheets are filled out, if required.

7.2 Sampling location is marked on the site map. Site map should have scale, north arrow, and prominent site features.

8. Deactivation of Sampling Apparatus:

8.1 Disconnect vacuum pump from vacuum chamber box.

8.2 Unthread PRT fitting and remove tubing and fitting from probe rods and expendable point holder.

8.3 Attach pull cap to rods and remove them from the soil.

8.4 Backfill boring with granular bentonite and replace the top 6 inches with native soil or repair with asphalt or concrete patch.

9. Sampling Equipment Decontamination

9.1 All downhole sampling equipment including rods and PRT fittings will be properly decontaminated by scrubbing and washing with Alconox soap and water followed by a triple distilled water rinse. Let dry and store tools in clean place on hydraulic soil probe rig or in trailer.

9.2 Glass Syringes with Detachable Needles (refer to Landmark's Field Procedure No. GC117 in Attachment A).

ATTACHMENT 1

POST-RUN TUBING OPERATION

Soil Gas Sampling — PRT System Operation

Basics

Using the Post-Run Tubing System, one can drive probe rods to the desired sampling depth, then insert and seal an internal tubing for soil gas sampling. The usual Geoprobe probe rods and driving accessories and the following tools are required:

- PRT Expendable Point Holder
- PRT Adapter
- Selected PRT Tubing

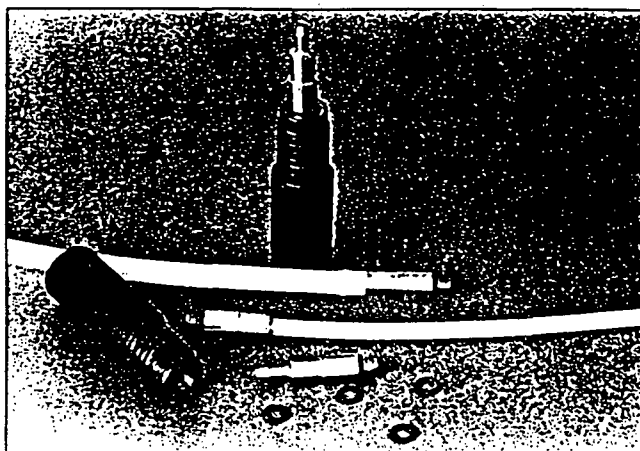
Preparation

1. Clean all parts prior to use. Install O-rings on the PR-13B and the PRT adapter.
2. Inspect the probe rods and clear them of all obstructions.
3. TEST FIT the adapter with the PRT fitting on the expendable point holder to assure that the threads are compatible and fit together smoothly.

NOTE: PRT fittings are left-hand threaded.

4. Push the adapter into the end of the selected tubing. Tape may be used on the outside of the adapter and tubing to prevent the tubing from spinning freely around the adapter during connection — especially when using Teflon tubing (Figure 1).

REMEMBER: The sample will not contact the outside of the tubing or adapter.



PRT SYSTEM PARTS

PRT Expendable Point Holder, PRT Adapters, Tubing, and O-rings.

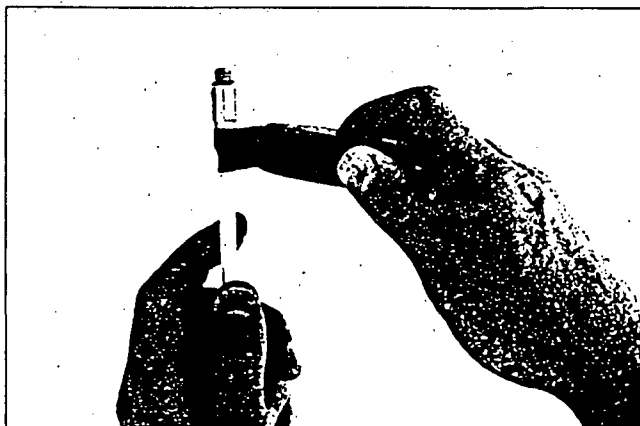


Figure 1. Securing adapter to tubing with tape. NOTE: Tape does not contact soil gas sample.

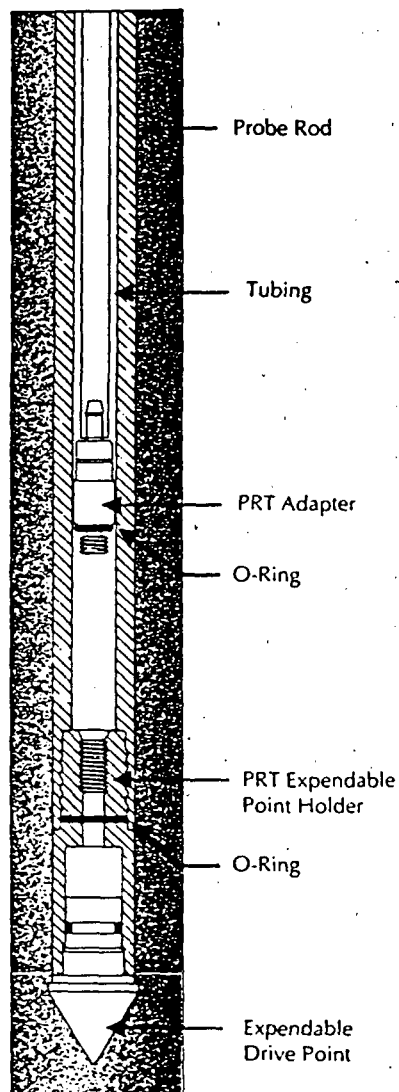


Figure 2. Insertion of tubing and PRT adapter.



Figure 3. Engaging threads by rotating tubing.

Soil Gas Sampling — PRT System Operation



A cross section of probe rods driven to depth and then retracted to allow for soil gas sampling. The PRT adapter and tubing are now fed through the rods and rotated to form a vacuum-tight connection at the point holder. The result is a continuous run of tubing from the sample level to the surface.

Probing

Drive the PRT tip configuration into the ground. Connect probe rods as necessary to reach the desired depth. After depth has been reached, disengage the expendable point by pulling up on the probe rods. Remove the pull cap from the top probe rod, and position the Geoprobe unit to allow room to work.

Connection

1. Insert the adapter end of the tubing down the inside diameter of the probe rods (Figure 2).
2. Feed the tubing down the rod bore until it hits bottom on the expendable point holder. Allow about 2 ft. (610 mm) of tubing to extend out of the hole before cutting it.
3. Grasp the excess tubing and apply some downward pressure while turning it in a counterclockwise motion to engage the adapter threads with the expendable point holder (Figure 3).
4. Pull up lightly on the tubing to test engagement of the threads. (Failure of adapter to thread could mean that intrusion of soil may have occurred during driving of probe rods or disengagement of drive point.)



Soil Gas Sampling — PRT System Operation

Sampling

1. Connect the outer end of the tubing to the Silicone Tubing Adapter and vacuum hose (or other sampling apparatus).
2. Follow the appropriate sampling procedure for collecting a soil gas sample (Figure 1).

Removal

1. After collecting a sample, disconnect the tubing from the vacuum hose or sampling system.
2. Pull up firmly on the tubing until it releases from the adapter at the bottom of the hole. (Taped tubing requires a stronger pull.)
3. Remove the tubing from the probe rods. Dispose of polyethylene tubing or decontaminate Teflon tubing as protocol dictates.
4. Retrieve the probe rods from the ground and recover the expendable point holder with the attached PRT adapter.
5. Inspect the O-ring at the base of the PRT adapter to verify that proper sealing was achieved during sampling. The O-ring should be compressed. This seal can be tested by capping the open end of the point holder applying vacuum to the PRT adapter.
6. Prepare for the next sample.



Figure 1. Taking a soil gas sample for direct injection into a GC with the PRT system.

Appendix D



APPENDIX B
DRAFT
SOIL SAMPLING PROCEDURES

PROCEDURE

TITLE

SS-1

GROUNDWATER SAMPLING - RETRACTABLE SCREEN POINT
(RSP) SYSTEM OPERATION

PREPARED BY _____ APPROVED BY _____

PROCEDURE NO. _____ REVISION NO. _____

DATE _____

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FIELD PROCEDURE NO. SS-1

SOIL SAMPLING - SYSTEM OPERATION

SUMMARY OF METHOD:

Specific interval or continuous soil sampling can be accomplished using a piston style probe-driven samplers. The piston sampler, unlike conventional split-spoon samplers, remain completely sealed while they are being driven to the desired sampling depth. The sampler contains an internal piston that is manually released upon reaching the desired sampling interval allowing soil to enter the sampling tube so it can be brought to the surface for inspection or analysis.

The piston samplers are fitted with liners made of either clear polybutyrate, Teflon, stainless steel, or brass depending on the specific sampling requirements. Once withdrawn from the sampler, the liners can be separated with a knife for inspection or capped and sent for laboratory analysis without further sample disruption. The most common lined piston sampler is the Large Bore sampler which collects a soil sample 1.125 " in diameter by 24 " long that is approximately 400 ml in volume. If the surface material consists of concrete or asphalt, a 2.0-inch diameter carbide-tipped concrete bit is used to hammer through the pavement using the hydraulic soil probe hammer. After the rods and RSP have been driven to the required sampling depth the rods are retracted approximately 36 inches allowing an internal 0.75-inch O.D. X 36-inch long 316 stainless steel wire-wrapped screen with 0.01-inch slots to drop through the bottom of the RSP into the aquifer cavity below leaving behind the expendable steel drive point. Refer to Attachment 2 for a detailed description of the Large Bore sampler.

Once the soil sample has been collected the probe rods and piston sampler are removed from the soil and the hole is sealed with granular bentonite. If necessary, asphalt or concrete patch is used to cap holes that have been created through paved or concrete areas.

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SUPPLIES:

- Hydraulic soil probe machine
- 14'X7' enclosed Pace American support trailer
- 3500 watt gasoline powered generator
- ~ 40 feet of 1-inch diameter steel probe rods
- 1.5-inch diameter Steel piston soil sampler with extension rods
- miscellaneous hand and probe tools
- 2.0-inch diameter carbide-tipped bit and drill steel
- clear acetate soil sample liners
- sample containers
- granular bentonite
- asphalt and concrete patch material

PROCEDURE

1. Determination of Sampling Locations:

1.1 Initial sampling locations will be determined by the client (CDM) prior to the start of the project.

1.2 Remaining sample locations may be determined by the following:

1.2.1 Client:

1.2.1.1 All sampling locations set up on a marked grid system.

1.2.1.2 Client decides location of remaining sampling locations based on results of initial study.

1.2.2. Client and TERRA-TRACE Personnel:

1.2.2.1. Client and TERRA-TRACE personnel decide location of remaining sampling locations based on results of initial sampling locations.

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2. Checks for Soil Sampling System Contamination:

2.1 All reuseable sampling equipment (ie. probe rods and piston sampler) will be thoroughly decontaminated prior to collection of each sample.

2.2 A decontaminated section of probe rods and a piston sampler will have distilled and deionized laboratory grade water run through and over the them. The rinsate water will be collected and containerized for analysis of contamination.

3. Sampling Probe Placement

3.1 The hydraulic soil probe is located over the sampling location and the probe mast is unfolded centered vertically over the sample location.

3.2 If concrete or asphalt are present a concrete bit and drill steel are connected to the probe hammer to penetrate the surface pavement.

3.3 Precleaned sample probe rods and piston sampler fittings are removed from storage.

3.4 A drive cap is fitted to the top of the probe rods and the rods and closed piston sampler are pushed and driven into the soil to the required sampling depth.

4. Soil Sample Collection

4.1 The drive cap is removed and the threaded extension rods are connected together with couplings and lowered down the hollow probe rods and threaded into the piston stop pin.

4.2 As the extension rods are turned clockwise the left-hand threaded stop pin is backed out and removed from the sampler. The extension rods and stop pin are brought to the surface.

4.3 The drive cap is placed back onto the top of the rods and the sampler is driven approximately two feet to collect a soil sample.

4.4 The drive cap is replaced with a pull cap and the rods and sampler are removed from the ground. The sampler is opened at the surface and the acetate liner is cut exposing the sample which can be collected in a container for analysis.

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5. Sampling Log Book and Documentation

5.1 A separate hard bound water proof notebook will kept with the TERRA-TRACE sampling team to record all necessary information during sampling events.

5.2 The notebook will include the date and time (in military notation) of each event, the names of sampling personnel, and a daily summary of activities for each day of sampling.

5.3 Individual sample collection data sheets will be filled for each sample collected. This information will be included in the summary Sampling Data Table and will include the following information:

5.3.1 Time (Military notation).

5.3.2 Sample Number (use "SS-" prefix or client's numbering system, whichever was established at the beginning of the project).

5.3.3 Sampling Depth or interval in feet.

5.3.4 Sample Collection Method

5.3.5 Sample volume collected (oz)

5.3.6 Number of attempts (borings) used.

5.3.7 Notes and any additional information requested by the client. This includes but is not limited to; description of the sampling location and general area, weather conditions, ground conditions, asphalt, concrete, soil appearance, surface water, odors, vegetation, backfill procedures and materials, etc.

6. Other Record Keeping:

6.1 Client-provided data sheets are filled out, if required.

6.2 Sampling location is marked on the site map. Site map should have scale, north arrow, and prominent site features.

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7. Deactivation of Sampling Apparatus:

- 7.1 Attach pull cap to rods and remove rods and sampler from the soil.
- 7.2 Remove soil sample from sampler and discard clear acetate sample liner, if applicable.
- 7.3 Backfill boring with granular bentonite and replace the top 6 inches with native soil or repair with asphalt or concrete patch.

8. Sampling Equipment Decontamination

- 8.1 All downhole sampling equipment including rods and piston sampler fittings will be properly decontaminated by scrubbing and washing with Alconox soap and water followed by a triple distilled water rinse. Let dry and store tools in clean place on hydraulic soil probe rig or in trailer.

ATTACHMENT 2

LARGE BORE SOIL SAMPLER OPERATION

GEOPROBE AT-660 SERIES LARGE BORE SOIL SAMPLER

Standard Operating Procedure (SOP)

Technical Bulletin No. 93-660

PREPARED: 9/21/1993

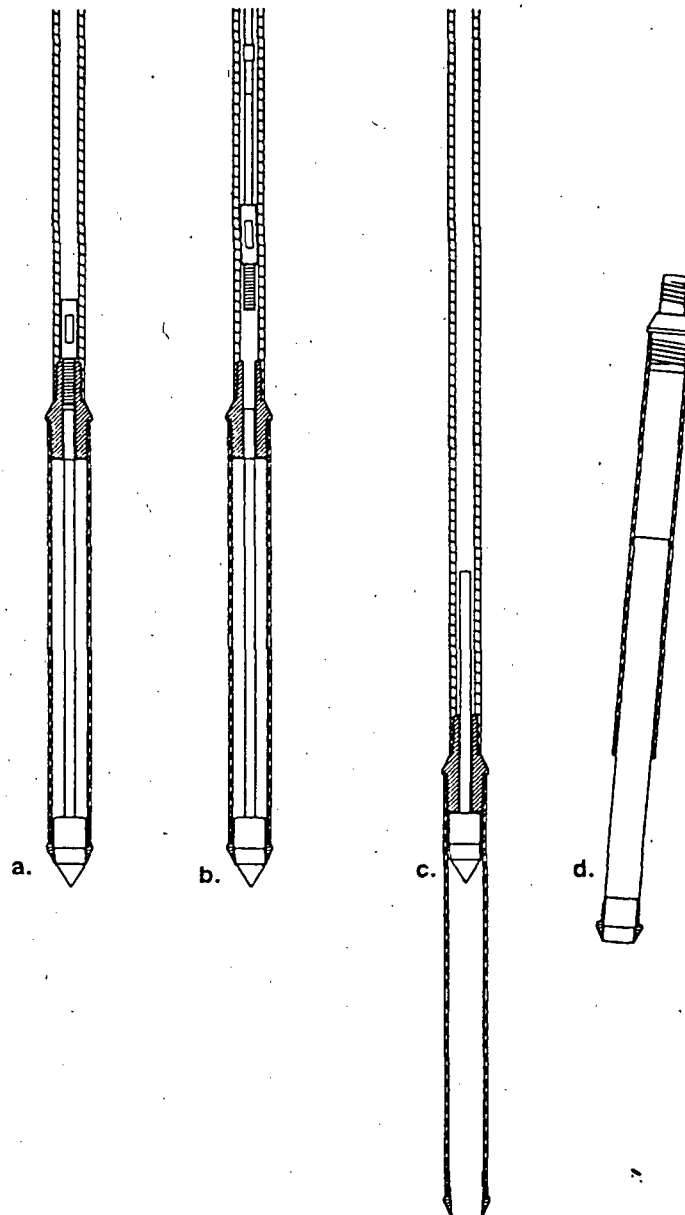


Figure 1. Driving and Sampling with the Large Bore Soil Sampler.

- a. Driving the Sealed Sampler
- b. Removing the Stop-pin
- c. Collecting a Sample
- d. Recovering Sample in Liner

1.0 OBJECTIVE

The objective of this procedure is to collect a discrete soil sample at depth and recover it for visual inspection and/or chemical analysis.

2.0 BACKGROUND

2.1 Definitions

Geoprobe*: A vehicle-mounted, hydraulically-powered, soil probing machine that utilizes static force and percussion to advance small diameter sampling tools into the subsurface for collecting soil core, soil gas, or ground water samples.

**(Geoprobe is a registered trademark of Kejr Engineering, Inc., Salina, Kansas.)*

Large Bore Sampler: A 24-inch long x 1-3/8-inch diameter piston-type soil sampler capable of recovering a discrete sample that measures up to 320 ml in volume, in the form of a 22-inch x 1-1/16-inch core contained inside a removable liner.

Liner: A 24-inch long x 1-1/8-inch diameter removable/replaceable, thin-walled tube inserted inside the Large Bore Sampler body for the purpose of containing and storing soil samples. Liner materials include brass, stainless steel, Teflon, and clear plastic (either PETG or cellulose acetate butyrate).

2.2 Discussion

In this procedure, the assembled Large Bore Sampler is connected to the leading end of a Geoprobe brand probe rod and driven into the subsurface using a Geoprobe machine. Additional probe rods are connected in succession to advance the sampler to depth. The sampler remains sealed (closed) by a piston tip as it is being driven. The piston is held in place by a reverse-threaded stop-pin at the trailing end of the sampler. When the sampler tip has reached the top of the desired sampling interval, a series of extension rods, sufficient to reach depth, are coupled together and lowered down the inside diameter of the probe rods. The extension rods are then rotated clock-wise (using a handle). The male threads on the leading end of the extension rods engage the female threads on the top end of the stop-pin, and the pin is removed. After the extension rods and stop-pin have been removed, the tool string is advanced an additional 24 inches. The piston is displaced inside the sampler body by the soil as the sample is cut. To recover the sample, the sampler is recovered from the hole and the liner containing the soil sample is removed. The operation is illustrated in Figure 1.

3.0 REQUIRED EQUIPMENT

The following equipment is required to recover soil core samples using the Geoprobe Large Bore Sampler and driving system. (Figure 2.) Note that the sample liners for the Large Bore Sampler are available in four different materials. Liner materials should be selected based on sampling purpose, analytical parameters, and data quality objectives.

Large Bore Sampler Parts	Quantity	Part Number
STD Piston Stop-pin, O-ring	1	AT-63, 63 R
LB Cutting Shoe	1	AT-660
LB Drive Head	1	AT-661
LB Sample Tube	1	AT-662
LB Piston Tip	1	AT-663
LB Piston Rod	1	AT-664
LB Clear Plastic Liner	variable	AT-665
LB Brass Liner	variable	AT-666
LB Stainless Steel Liner	variable	AT-667
LB Teflon* Liner	variable	AT-668
LB Cutting Shoe Wrench	1	AT-669
Vinyl End Caps	variable	AT-641
Teflon* Tape	variable	AT-640 T

**(Teflon is a Registered Trademark of E.I. du Pont de Nemours & Co.)*

Geoprobe Tools	Quantity	Part Number
Probe Rod (3 foot)	variable	AT-10 B
Probe Rod (2 foot)	1	AT-10 B
Probe Rod (1 foot)	1	AT-10 B
Drive Cap	1	AT-11 B
Pull Cap	1	AT-12 B
Extension Rod	variable	AT-67
Extension Rod Coupler	variable	AT-68
Extension Rod Handle	1	AT-69

Optional

LB Manual Extruder	1	AT-659 K
Extension Rod Jig	1	GW-469
LB Pre-Probe	1	AT-146B

Additional Tools

Vise Grips
Open Ended Wrench (3/8-inch)
1-inch or Adjustable Wrench

4.0 OPERATION

4.1 Decontamination

Before and after each use, thoroughly clean all parts of the soil sampling system according to project specific requirements. A clean, new liner is recommended for each use. Parts should also be inspected for wear or damage at this time.

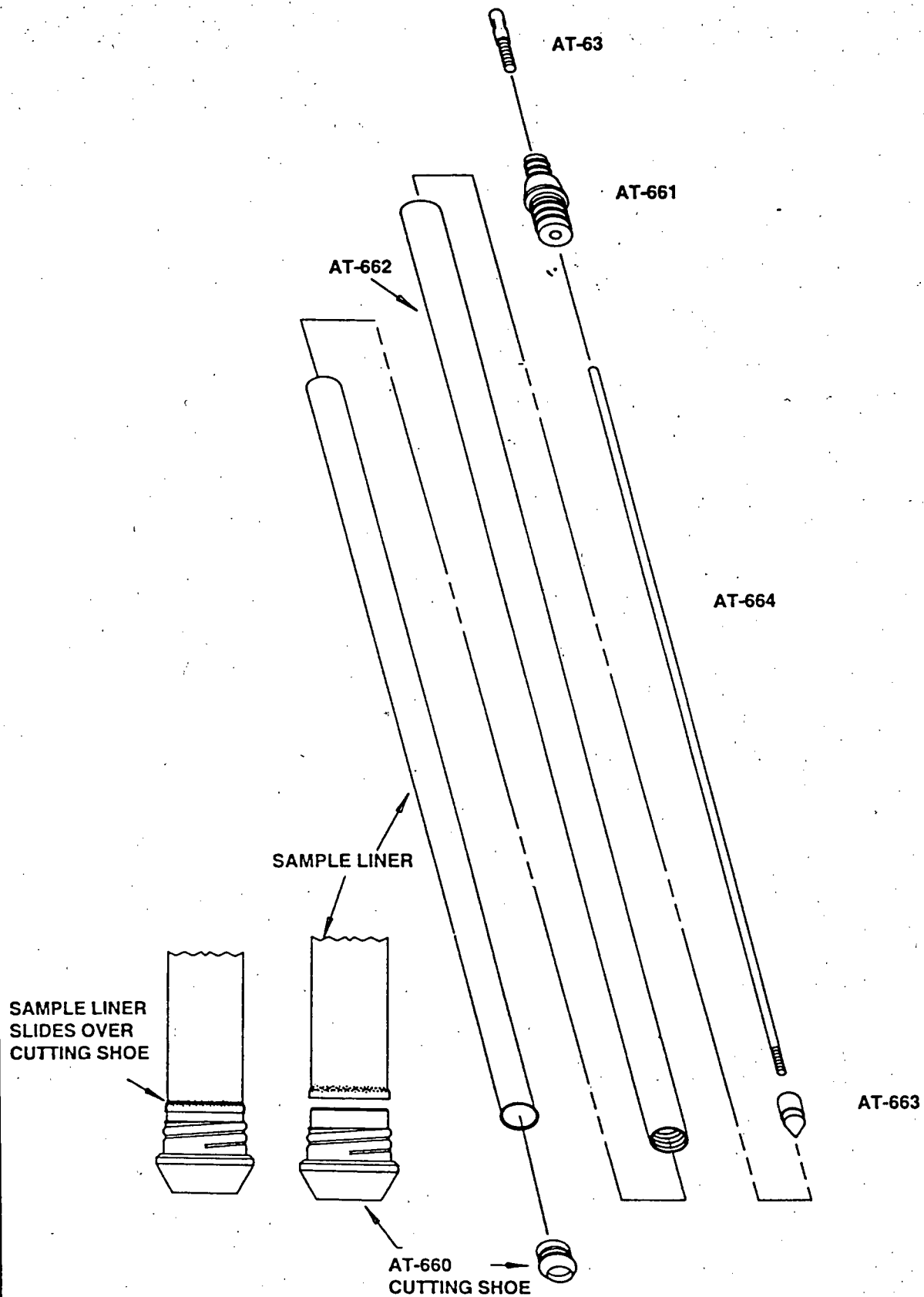


Figure 2. Large Bore Sampler Parts

4.2 Assembly

1. Install a new AT-63R O-ring into the O-ring groove on the AT-63 Stop-pin.
2. Seat the pre-flared end of the LB Liner (AT-665, -666, -667, or -668) over the interior end of the AT-660 Cutting Shoe. (Figure 3.) It should fit snugly.
3. Insert the liner into either end of the AT-662 Sample Tube and screw the cutting shoe and liner into place. If excessive resistance is encountered during this task, it may be necessary to use the AT-669 LB Shoe Wrench. Place the wrench on the ground and position the sampler assembly with the shoe end down so that the recessed notch on the cutting shoe aligns with the pin in the socket of the wrench. (Figure 4.) Push down on the sample tube while turning it, until the cutting shoe is threaded tightly into place.
4. Screw the AT-664 Piston Rod into the AT-663 Piston Tip. Insert the piston tip and rod into the sample tube from the end opposite the cutting shoe. Push and rotate the rod until the tip is seated completely into the cutting shoe.
5. Screw the AT-661 Drive Head onto the top end of the sample tube, aligning the piston rod through the center bore.
6. Screw the reverse-threaded AT-63 Stop-pin into the top of the drive head and turn it counter-clockwise with a 3/8-inch wrench until tight. Hold the drive head in place with a 1-inch or adjustable wrench while completing this task to assure that the drive head stays completely seated. The assembly is now complete.

4.3 Pilot Hole

A pilot hole is appropriate when the surface to be penetrated contains gravel, asphalt, hard sands, or rubble. Pre-probing can prevent unnecessary wear on the sampling tools. A Large Bore Pre-Probe (AT-146B) may be used for this purpose. The pilot hole should be made only to a depth above the sampling interval. Where surface pavements are present, a hole may be drilled with the Geoprobe using a Drill Steel (AT-32, -33, -34, or -35, depending upon the thickness of the pavement), tipped with a 1.5-inch diameter Carbide Drill Bit (AT-36) prior to probing. For pavements in excess of 6 inches, the use of compressed air to remove cuttings is recommended.

4.4 Driving

1. Attach an AT-106B 1-foot Probe Rod to the assembled sampler and an AT-11B Drive Cap to the probe rod. Position the assembly for driving into the subsurface.
2. Drive the assembly into the subsurface until the drive head of the LB sample tube is just above the ground surface.
3. Remove the drive cap and the 1-foot probe rod. Secure the drive head with a 1-inch or adjustable wrench and re-tighten the stop-pin with a 3/8-inch wrench. (Figure 5.)

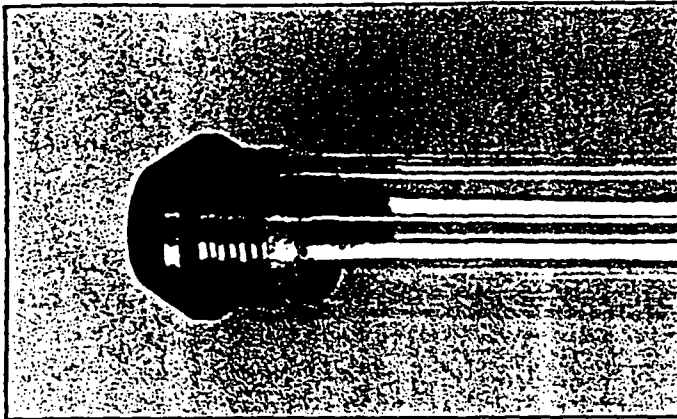


Figure 3. Liner fits snugly over interior end of cutting shoe.

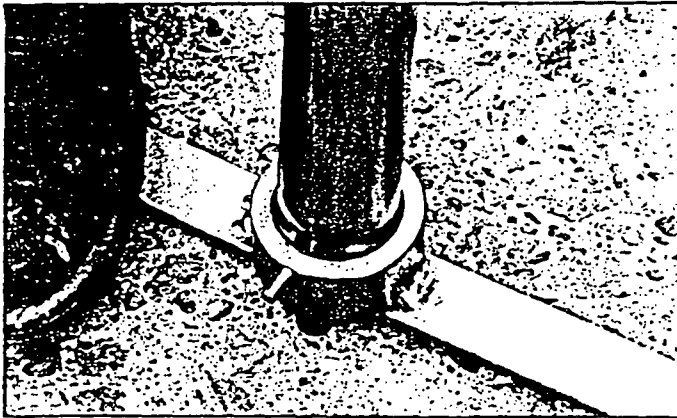


Figure 4. Using the AT-669 Cutting Shoe Wrench to attach cutting shoe.



Figure 5. Tightening the Stop-pin.

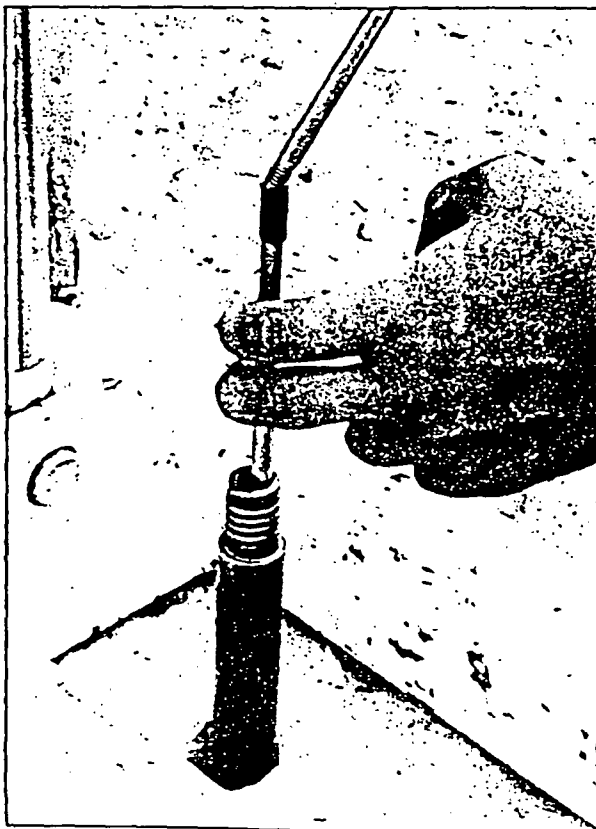


Figure 6. Coupling Extension Rods together.

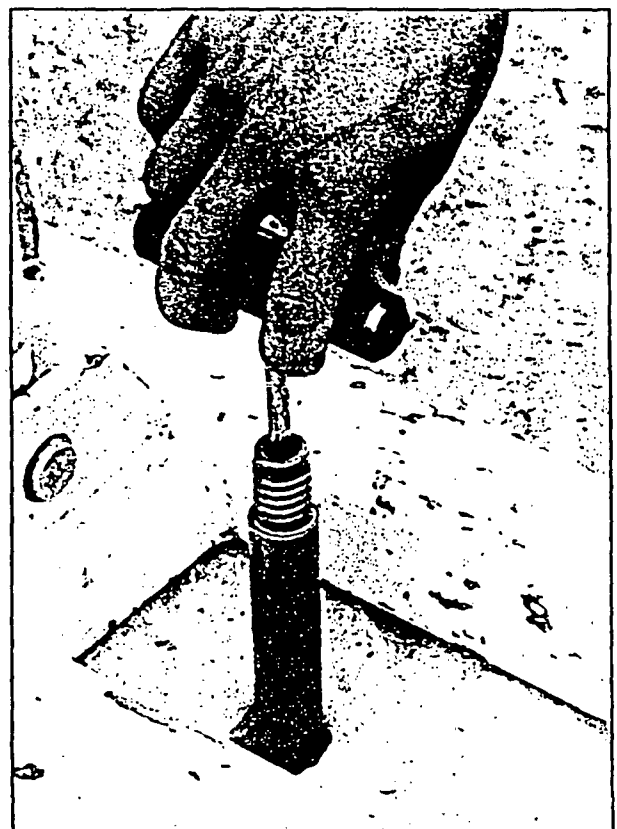


Figure 7. Rotating the Extension Rod Handle.

4.4 Driving (continued from page 5)

4. Attach an AT-105B 2-foot Probe Rod and a drive cap, and continue to drive the sampler into the ground. Attach AT-10B 3-foot Probe Rods in succession until the leading end of the sampler reaches the top of the desired sampling interval.

4.5 Preparing to Sample

1. When sampling depth has been reached, position the Geoprobe machine away from the top of the probe rod to allow room to work.

2. Insert an AT-67 Extension Rod down the inside diameter of the probe rods. Hold onto it and place an AT-68 Extension Rod Coupler on the top threads of the extension rod (the down-hole end of the leading extension rod should remain uncovered). Attach another extension rod to the coupler and lower the jointed rods down-hole. (Figure 6.)

3. Couple additional extension rods together in the same fashion as in Step 2. Use the same number of extension rods as there are probe rods in the ground. The leading extension rod must reach the stop-pin at the top of the sampler assembly. When coupling extension rods together, you may opt to use the GW-469 Extension Rod Jig to hold the down-hole extension rods while adding additional rods.

4. When the leading extension rod has reached the stop-pin down-hole, attach the AT-69 Extension Rod Handle to the top extension rod.

5. Turn the handle clockwise (right-handed) until the stop-pin detaches from the threads on the drive head. (Figure 7.) Pull up lightly on the extension rods during this procedure to check thread engagement.

6. Remove the extension rods and uncouple the sections as each joint is pulled from the hole. The Extension Rod Jig may be used to hold the rod couplers in place as the top extension rods are removed.

7. The stop-pin should be attached to the bottom of the last extension rod upon removal. Inspect it for damage. Once the stop-pin has been removed, the sampler is ready to be re-driven to collect a sample.

4.6 Sample Collection

1. Reposition the Geoprobe machine over the probe rods, adding an additional probe rod to the tool string if necessary. Make a mark on the probe rod 24 inches above the ground surface (this is the distance the tool string will be advanced).

2. Attach a drive cap to the probe rod and drive the tool string and sampler another 24 inches. Use of the Geoprobe's hammer function during sample collection may increase the sample recovery in certain formations. Do not over-drive the sampler.

4.7 Retrieval

1. Remove the drive cap on the top probe rod and attach an AT-12B Pull Cap. Lower the probe shell and close the hammer latch over the pull cap.
2. With the Geoprobe foot firmly on the ground, pull the tool string out of the hole. Stop when the top (drive head) of the sampler is about 12 inches above the ground surface.
3. Because the piston tip and rod have been displaced inside the sample tube, the piston rod now extends into the 2-foot probe rod section. In loose soils, the 2-foot probe rod and sampler may be recovered as one piece by using the foot control to lift the sampler the remaining distance out of the hole.
4. If excessive resistance is encountered while attempting to lift the sampler and probe rod out of the hole using the foot control, unscrew the drive head from the sampler and remove it with the probe rod, the piston rod, and the piston tip. Replace the drive head onto the sampler and attach a pull cap to it. Lower the probe shell and close the hammer latch over the pull cap and pull the sampler the remaining distance out of the hole with the probe machine foot firmly on the ground.

4.8 Sample Recovery

1. Detach the 2-foot probe rod if it has not been done previously.
2. Unscrew the cutting shoe using the AT-669 LB Cutting Shoe Wrench, if necessary. Pull the cutting shoe out with the liner attached. (Figure 8.) If the liner doesn't slide out readily with the cutting shoe, take off the drive head and push down on the side wall of the liner. The liner and sample should slide out easily.

4.9 Core Liner Capping

1. The ends of the liners can be capped off using the AT-641 Vinyl End Cap for further storage or transportation. A black end cap should be used at the bottom (down end) of the sample core and a red end cap at the top (up end) of the core.
2. On brass, stainless steel, and teflon liners, cover the end of the sample tube with AT-640T Teflon Tape before placing the end caps on the liner. (Figure 9.) The tape should be smoothed out and pressed over the end of the soil core so as to minimize headspace. However, care should be taken not to stretch and, therefore, thin the teflon tape.

4.10 Sample Removal

1. Large Bore Clear Plastic and Teflon Liners can be slit open easily with a utility knife for the samples to be analyzed or placed in appropriate containers.
2. Large Bore Brass and Stainless Steel liners separate into four 6-inch sections. The AT-659K Large Bore Manual Extruder may be used to push the soil cores out of the liner sections for analysis or for transfer to other containers. (Figure 10.)

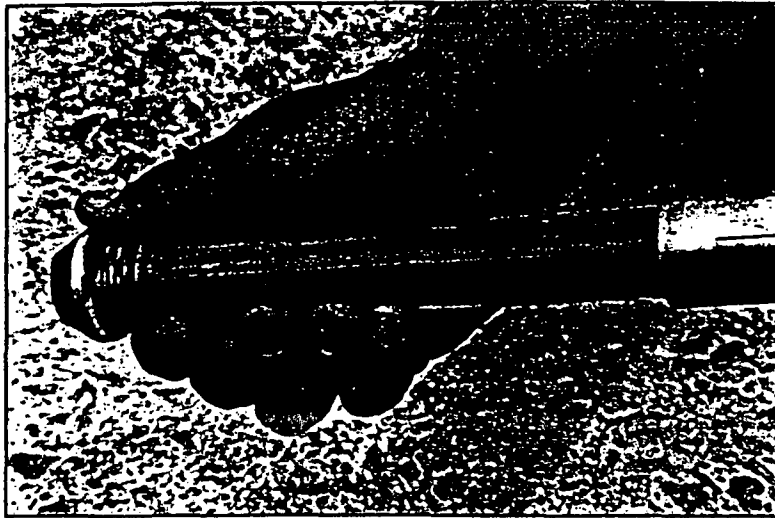


Figure 8. Removing the liner to recover the Sample.

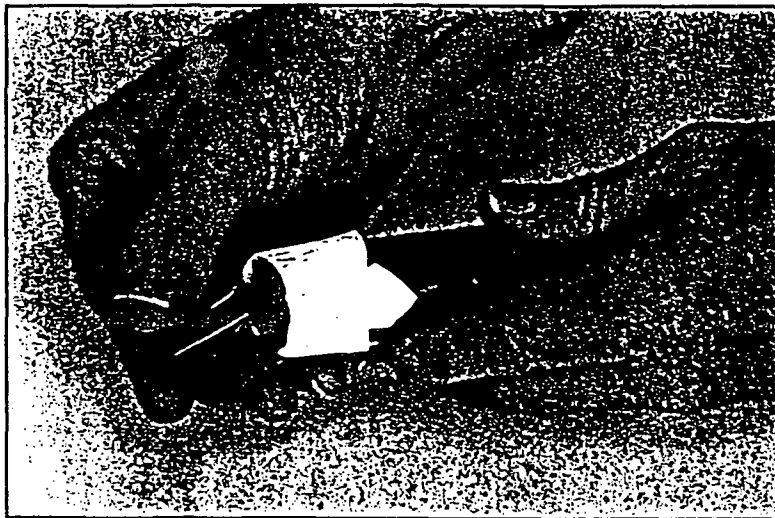


Figure 9. Covering the liner end with Teflon tape for capping.

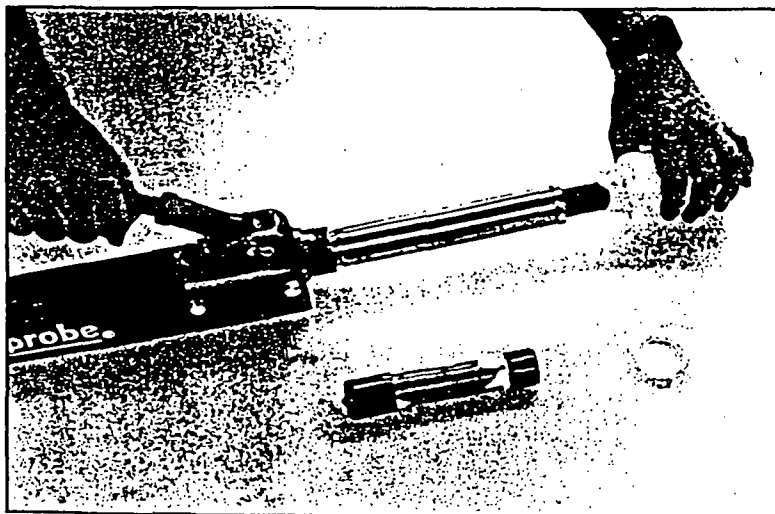


Figure 10. Extruding a sample in a metal liner using the AT-659K manual extruder.

5.0 REFERENCES

Geoprobe Systems, August 1993, "1993-94 Equipment and Tools Catalog".

LANDMARK TECHNOLOGIES, INC.
METHOD L8021SG

PERPARED FOR CDM
4 AUGUST 1995
Revised
24 OCTOBER 1995

SOUTHEAST ROCKFORD
GROUNDWATER CONTAMINATION SITE

STANDARD OPERATING PROCEDURES
FOR FIELD ANALYSES OF SOIL GAS

GC101
GC102c
GC103c
GC105
GC109c
GC110
GC117
GC118

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APPROVED BY:
PROJECT ID: SOUTHEAST ROCKFORD

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DATE: 10/24/95

FIELD PROCEDURE NO. GC101

SRI MODEL 8610 GAS CHROMATOGRAPH START-UP with SRI MODEL 8690-0051 PURGE-and-TRAP

PROCEDURE:

1. Check column configuration.
 - 1.1. Target compounds are: 1,2-DCE (trans and cis), 1,1,1-TCA, PCE, TCE, 1,1-DCA, and Vinyl Chloride.

Then install: 75m, 0.53mm ID, 3.0um Rtx-624 Column.
Tenax GR Trap.

Set column flows to: 10 cc/min. Hydrogen

Set column temperature to: 40 C to 165 C at 6 C/minute.
2. Turn on the Hydrogen and Helium tank valves and adjust the regulator line pressures to 60 psi and 40 psi, respectively.
3. Turn on computer.
 - 3.1 Load PeakSimple® Software.
 - 3.1.1 Turn on GC.
 - 3.1.2 Go to the Controls Menu and load appropriate control file.
 - 3.1.3 Turn on Purge-and-Trap.
4. Allow injector, oven, detectors, and purge-and-trap to achieve thermal equilibrium.
5. Check all pressure settings.

5.1 Column carrier gas.

NOTE: Flows must be set when new columns are installed or when the line pressure has been changed.

5.1.1. Switch LCD toggle to the down position and confirm carrier pressure setting.

5.1.2. Adjust the flow using the appropriate flow controller on the left front panel of the GC (100 equals 6.7 cc/min Hydrogen at regulator pressure setting of 50 psi).

5.2 Sparge gas.

NOTE: Flows must be reset when line pressure is changed.

5.2.1. Switch LCD toggle to the down position and confirm sparge gas pressure setting at 8.3 psi.

5.2.2. Adjust the flow using the appropriate flow controller on the left side panel of the GC.

5.3 ELCD propanol delivery gas (Helium is utilized to pressurize the propanol delivery vessel.

NOTE: Flows must be reset when line pressure is changed.

5.3.1. Observe pressure regulator dial in propanol delivery tray. Regulator should be set at 5 - 8 psi.

5.3.2. Adjust the flow using the appropriate flow controller on the front panel of the propanol delivery tray.

6. Check for leaks by placing a few drops of Leak Check® above the nuts on all column fittings in the oven.
7. Check detector attenuation and gain settings on right side of GC:

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7.1 PID - 1/LOW

7.2 ELCD - 1/LOW

8. Note the following chromatographic parameters in the GC daily log book:

- a) Analyst name
- b) Date
- c) Trap, valve, injector, column, and detector temperatures
- d) Sparge and column flows
- e) ELCD and PID attenuation and gain
- f) Column type, diameter, and length
- g) Trap type

9. Allow baselines to stabilize before calibration (about 15 minutes).

FIELD PROCEDURE NO. GC102c

PREPARATION OF GASEOUS CALIBRATION STANDARDS FOR
5-POINT CALIBRATION

SUMMARY OF METHOD:

A 10 ppm gas mixture containing the chemical standards in a balance of pure (98%) VOC-free nitrogen is purchased from Scott Specialty Gases a commercial vender.

Five working standards are prepared at the beginning of each work week by serial dilution. The working standards are prepared in 500 mL Tedlar bags by diluting the appropriate quantity of the stock gas mixture into 500 mL of pure (98%) VOC-free nitrogen.

Each compound will be quantified at five concentration levels (1 ug/L, 5 ug/L, 50 ug/L, 500 ug/L, and 1,000 ug/L). The calibration is considered linear if their associated coefficient of linear regression is .95 or higher. If the calibration is considered linear then an average response factor will be used to quantify sample concentrations.

SUPPLIES:

- Dedicated 1,000 uL and 10 mL gas tight syringes
- Pure (98%) VOC-free nitrogen
- 500 mL Tedlar bags
- Stock gas mixture

PROCEDURE:

1. Analyze the VOC-free nitrogen used to make the working standards once per job (or once per week if job lasts more than one week) to check its purity and check for injector insert contamination.

NOTE: This must be documented with a chromatograph.

2. Retrieve the dedicated gas tight syringes to transfer stock gas mixture to the working standard Tedlar bags.
3. Obtain five 500 mL Tedlar bags with Teflon-lined septum and fill with VOC-free nitrogen. Label the bags with standard ID, concentrations, date, and your initials.

5. Flush the dedicated gas tight syringe with VOC-free nitrogen once by withdrawing approximately 80% of syringe capacity and expelling it outside the feed line.

NOTE: Do not expel the rinse into the nitrogen feed line as it may contaminate the delivery system.

6. Inject the appropriate amount of primary methanol standard into water to yield five concentrations: 1) equal to the detection limit; 2) 5 times the detection limit; 3) 10 times Number 2; 4) 10 times Number 3; and 5) the maximum value for that compounds linear range.

Analyte/Calibration Levels*	1	2	3	4	5
Vinyl chloride	1	5	50	500	1000
1,2-Dichloroethene	1	5	50	500	1000
1,1-Dichloroethane	1	5	50	500	1000
Trichlorethene	1	5	50	500	1000
1,1,1-Trichloroethane	1	5	50	500	1000
Tetrachloroethene	1	5	50	500	1000

* Calibration levels are ug/L

NOTE: When injecting the gas mixture into the nitrogen filled Tedlar bag, depress the plunger and remove the needle. Do not flush the needle with the newly created standard.

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FIELD PROCEDURE NO. GC103c

5-POINT CALIBRATION FOR GASEOUS STANDARD ANALYSIS UTILIZING A PRE-COLUMN CONCENTRATOR

EQUIPMENT:

- Gas Chromatograph
- Detector
- Computer
- Purge-and-trap concentrator

SUPPLIES:

- 100 mL gas tight syringes
- 500 mL Tedlar bags with septums

PROCEDURE:

1. Follow Procedure GC101 for GC start-up. Instrumentation is now ready for calibration.
2. Prepare standards via Procedure GC102c for target compounds.
3. Analyze one of each of the following to determine if any contamination exists in the analytical equipment or supplies.
 - 3.1. Carrier Gas Blank: Blank a 100 mL syringe with carrier gas at the start of each day.

NOTE: If any of the representative syringes show contamination, all syringes must be blanked prior to use.

If it is necessary for any syringe to be used again before cleaning, it must be blanked prior to its second use.

- 3.1.1. Obtain a clean 100 mL glass syringe.
- 3.1.2. Purge syringe and needle of dead volume by extracting and expelling carrier gas several times.
- 3.1.3. Fill purged syringe with 100 mL of carrier.

- 3.1.4 Press space bar on the computer key board to initiate the run.
- 3.1.5 Introduce sample through the injection port on the purge-and-trap.
- 3.1.5. Analysis starts now.
- 3.1.6. Update chromatograph data file with blank ID, and injection volume.
- 3.1.7 Quality control for this sample requires that the compounds of interest not be present at or above the method detection limit.
- 3.2 Nitrogen Blank: The VOC-free nitrogen is checked at the beginning of each day, or once per week if the job lasts longer than a week, to determine if any contamination exists in the nitrogen or injection port insert.
 - 3.2.1 Obtain a clean 100 mL syringe.
 - 3.2.2 Purge the syringe by drawing VOC-free nitrogen into the syringe and expelling it several times.
 - 3.2.3 Draw 100 mL of VOC-free nitrogen into the syringe as measured from the end of the plunger.
 - 3.2.4 Press space bar on the computer key board to initiate the run.
 - 3.2.5 Introduce sample through the injection port on the purge-and-trap.
 - 3.2.6 Analysis starts now.
 - 3.2.7 Update chromatograph data file with blank ID, and injection volume.
 - 3.2.8 Quality control for this sample requires that the compounds of interest not be present at or above the method detection limit.
- 4. Analyze each of the five different standard concentration levels at the start of each job (or once per week if the project lasts more than one week). Then enter the results from each concentration level into the project specific calibration table (see Procedure GC105) allowing the computer to calculate the response factors for each concentration level. The five response factors are considered to be linear if their associated coefficient of linear regression is .95 or higher. In this case, the average of the response factors can be used to quantify sample concentrations.

A continuing calibration verification standard or quality control [QC] check standard will be performed at the start of each project day, after every 10 field samples, and at the end of each project day. The QC criteria for these standards requires that the calculated concentrations for these standards falls within +/- 20% of the known concentration injected.

- 4.1. Retrieve the 100 mL dedicated syringe for the compound suite of interest. If a dedicated syringe is not available, blank a 100 mL syringe and dedicate it to the standard.
- 4.2. Insert needle into gaseous standard Tedlar bag and extract 100 mL.
- 4.3. Press space bar on the computer key board to initiate the run.
- 4.4. Introduce sample through the injection port on the purge-and-trap.
5. Analysis begins now.
6. Update chromatograph data file with standard ID, and injection volume.
7. After each of the five gaseous concentrations have been run analyzed, integration checked, and linear regression confirmed (>.95) the GC is now programed with the 5-point calibration curve for gaseous standard analysis.
8. Before running samples, one of each of the following should under go analysis to determine if any contamination exists in the sampling equipment or supplies.
 - 8.1. System Blank: System blanks are ambient air drawn through an aboveground sampling probe and complete sampling apparatus (probe, adaptor, and syringe). Analyze system blank by the same procedure as a soil gas sample (Procedure GC109).
 - 8.1.1. One system blank is run at the start of each day and compared to a concurrently sampled ambient air analysis.
 - 8.1.2. Run a system blank before reusing any sampling system component.
 - 8.2. Ambient Air Sample: Collect a sample of ambient air near the system blank probe at the same time the system blank is taken. Analyze air samples by the same procedure as a soil gas sample (Procedure GC109).

Run at least two additional ambient air samples during the day to monitor site background concentrations.

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9. Input into the computer and GC log book the following information for the carrier blank, nitrogen blank, system blank, and ambient air sample:
 - a) sample identification
 - b) time of analysis
 - c) injection volume
 - d) sample volume
 - e) area counts of target compounds
10. GC is ready for direct injection analysis of soil gas samples.

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FIELD PROCEDURE GC109

DIRECT INJECTION ANALYSES OF SOIL GAS SAMPLES UTILIZING A PER COLUMN CONCENTRATOR

SUMMARY OF METHOD:

Chromatographic retention time identifies halocarbon and hydrocarbon compounds detected in soil gas. Verification of compound identity can be enhanced by chromatographic analysis via in-series utilization of detectors with differing selectivity.

Quantification of compounds is achieved by comparison of the detector response of the sample with the response measured for calibration standards (external standardization). System blanks are run at the beginning of the day to check for contamination in the soil gas equipment. Instrument calibration checks are run periodically through out the day. Ambient air samples are also routinely analyzed to check for background levels in the atmosphere. At least three air samples should be collected each day.

Proprietary modifications to the gas chromatograph allow direct injections of soil gas samples/standards for analysis.

EQUIPMENT:

- Gas Chromatograph
- Detector
- Computer
- Purge-and-trap

SUPPLIES:

- 100 mL, 10 mL, and 1 mL Glass Syringes
- 500 mL Tedlar bags
- Pure (98%) VOC-free nitrogen
- Calibration Standard

PROCEDURE:

1. Follow Procedure GC101 for GC start-up.
2. Follow Procedure GC102c for preparation of gaseous calibration standards for 5-point calibration.

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3. Follow Procedure GC103c for calibration for gaseous standard analysis utilizing a pre-column concentrator.
4. Instrumentation is now ready for sample analyses. Run samples as they are collected.
 - 4.1. Inject 100 mL of sample whenever possible so long as peak response does not exceed the linear range of the detector.
 - 4.2. Whenever possible, keep the attenuation for unknown samples constant throughout the day to facilitate verification of integration.
 - 4.3. Document all changes.
 - 4.4. If linear range is exceeded for any compound, reduce the injection size until the response becomes linear.
 - 4.5. If response remains outside of linear range with a 10 uL injection, dilute the sample via Procedure GC110.
- NOTE: Dilutions should be avoided if possible. Small injections with microliter syringes produce more reliably accurate results.
- 4.6. Document all sample analysis.
- 4.7. Label all analyses in ug/L. Avoid PPM and PPB notations.
5. Obtain a clean 100 mL glass syringe. This is the sub-sampling syringe.
6. Insert the needle of the 100 mL syringe through the septa of the 500 mL Tedlar sample bag.
7. Purge the syringe and needle several times with sample to lessen the effect of needle dead space dilution.
8. Extract 100 mL sample from the Tedlar sample bag.

NOTE: This is called a sub-sample.

Actual sample volume will be determined by the response of the target compounds. The sample volumes may range from 10 uL for high response to 100 mL for low response. Often, the client is aware of potential sources and can warn you when high concentrations are expected.

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9. Press space bar on the computer key board to initiate the run.
10. Introduce sample through the injection port on the purge-and-trap.
11. Analysis begins now.
12. Update chromatograph data file with the sample ID and sample volume. After duplicate analyses have been run (if necessary), integration checked, and surrogate reproducibility confirmed (within 20%), input into the GC log book the following information for each injection and save results to the computers hard drive:
 - a) sample identification
 - b) time of analysis
 - c) volume of injection
 - d) area counts of target compounds
13. After all samples have been analyzed copy all computer files (i.e., .chr, .tem, .con, .res, etc.) to 3.5" diskettes.
14. Place used syringes in a separate container for decontamination.

APPENDIX B
CALIBRATION AND MAINTENANCE PROCEDURE FOR ANALYTICAL FIELD
EQUIPMENT

EQUIPMENT AND INSTRUMENT CALIBRATION AND MAINTENANCE, GENERAL REQUIREMENTS

1.0 INTRODUCTION

The general guidelines for calibrating and maintaining instruments and monitoring equipment are presented in this document.

2.0 CALIBRATION AND MAINTENANCE PROCEDURES

Calibration and maintenance procedures are documented for each piece of equipment affecting quality. Calibration and maintenance procedures are developed based on manufacturer's specifications and are retained in the Site Investigation Procedures Manual. These procedures include, but are not limited to:

1. Equipment identification (name) and description.
2. Equipment specifications.
3. Calibration and/or maintenance schedule.
4. Equipment necessary to accomplish calibration (where applicable).
5. Procedure for calibration and/or maintenance.

3.0 CALIBRATION LABEL

Instruments requiring calibration and/or maintenance have a prominently displayed sticker containing the following information:

1. Date of calibration and/or maintenance.
2. Next due date for calibration and/or maintenance.
3. Initials of person performing calibration and/or maintenance.
4. Span gas and concentration(s) (if applicable).
5. Span or sensitivity setting (if applicable).

4.0 EQUIPMENT LOG BOOK

An equipment log book is issued to record the life history of each measuring and testing device used in activities affecting quality. This book is a three ring binder in which individual records for each piece of equipment are maintained. A form such as F6101 or a reasonable facsimile should be used to maintain the calibration and maintenance record. The record should include:

1. Equipment identification (name) and control number.
2. Date of calibration and/or maintenance.
3. Condition of equipment.
4. Activity performed on instrument (calibration and/or maintenance).
5. Adjustments made and accuracy of equipment prior to and following calibration (where applicable).
6. Record of equipment failure or inability to meet specifications (where applicable).
7. Initials of person performing calibration/maintenance.
8. Next due date for calibration and/or maintenance.

5.0 CALIBRATION/MAINTENANCE FORM

An instrument specific calibration/maintenance form will be developed to record data relating to each individual calibration/maintenance event. A single form will be used for each calibration/maintenance event. In addition to the data recorded in the calibration/maintenance log, the following items should also be included in the instrument specific form (where applicable).

1. Calibration calculations and curves.
2. Span gas type and concentrations.
3. Span or sensitivity range settings.
4. Specifics on repairs and parts replaced, added, or removed.

5. Instrument's overall condition.

6.0 FIELD CALIBRATION

As part of normal field operations, some instruments require calibration prior to, during, and/or after field use. This field operation calibration should remain separate from pre-field calibrations and should not be used as a substitute for standard calibration activities. Field calibration should be recorded in field log books or on field forms as part of the normal field data collection process. Field calibration records should not be included in the history log.

7.0 INSTRUMENTS NOT IN COMPLIANCE

If the calibration schedule is not adequately maintained, or if accuracy as reported in specifications cannot be attained for a specific instrument, that instrument is labelled "HOLD" and is unavailable for use until it is repaired and specifications are attained.

CALIBRATION AND MAINTENANCE PROCEDURE
YSI MODEL 33 S-C-T METER

1.0 INTRODUCTION

This procedure presents steps to calibrate and maintain the YSI Model 33 S-C-T meter. Operation principles, procedures, and equipment specifications are presented in Procedure 5617002 and are not repeated here.

2.0 CALIBRATION

2.1 Temperature

2.1.1 Temperature Knob Setting

It is possible for the temperature knob to become loose or slip from its normal position. In an emergency, the dial can be repositioned. It must be emphasized that this is an emergency procedure only and that the instrument should be returned to the factory for proper recalibration - at the earliest opportunity.

To recalibrate the temperature setting:

1. Red line instrument and then place probe in sample of known conductivity.
2. Read and record the temperature and conductivity of the solution using appropriate settings. Leave probe in solution.
3. Determine the salinity of the solution by running a line vertically on Figure 1 until it intersects the appropriate 'C' line. From this intersection, extend a line horizontally to the left edge of the graph (Figure 1). This determines the salinity of the sample.

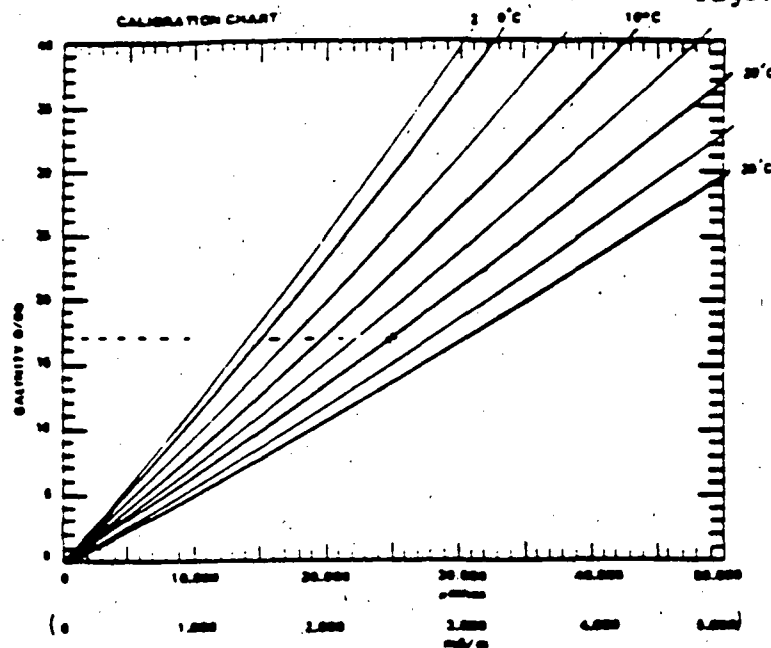


Figure 1. Calibration Chart for Resetting Temperature Knob

4. Remove the 'C knob switch to SALINITY, and turn the control shaft until the meter needle indicates the salinity value determined in step 3.
5. Switch to TEMPERATURE. If this temperature is the same as step 2, continue. If not, repeat steps 1 through 5.
6. Place the knob on the control shaft - without turning the control shaft - with the pointer at the same temperature as the meter reading. Tighten both sets of screws securely. Care must be taken at this step so that the shaft setting is not moved.
7. Return the instrument to the factory at the earliest opportunity.

2.1.2 Temperature Probe/Instrument

To check the accuracy of the Probe/Instrument temperature readings:

1. Place NBS traceable thermometer in solution with thermometer and probe.
2. Place instrument in temperature mode after zeroing and red lining the instrument.

3. After five minutes, compare temperature of thermometer and instrument. If the instrument varies by $\pm 1^\circ\text{C}$, the instrument should be returned to the factory for calibration and maintenance.

2.2 Probe Cell Calibration

The YSI #3300 Series Cells are calibrated to absolute accuracy of ± 1.5 percent based on a standard solution of 0.01 molal KCl. To prepare this solution:

1. In a one liter flask, dissolve 0.745 grams of pure dry KCl until the solution is one kilogram in weight.
2. Use Table 1 and the temperature of the water to determine the conductivity of the solution just prepared. Note: Table 1 shows conductivity as if the distilled water was nonconductive. Since even high purity distilled water is slightly conductive, the measured conductivity will be higher by an amount equal to the water's conductivity.
3. Place probe in solution and measure conductivity. The conductivity of the solution plus the conductivity of the distilled water should not vary from the meter reading by $\pm 1.5\%$. If the reading is greater than 1.5% , clean the probe and then recheck the conductivity. If after cleaning it is not possible to measure the conductivity of the calibration solution within $\pm 1.5\%$, the probe and instrument should be returned to the manufacturer for calibration and maintenance.

3.0 MAINTENANCE

3.1 Batteries

The batteries should be replaced either (1) when it is not possible to red line the instrument, (2) after 200 hours of operation, or (3) every 6 months to reduce the danger of corrosion due to leaky batteries.

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To replace batteries, remove the six screws from the rear plate. The battery holders are color coded. The positive (+ button) end must go on red.

Use two "D" size alkaline flashlight cells (Eveready E95 or equivalent).

3.2 Probe

3.2.1 Cleaning

When the cell test indicates low readings, the probable cause is dirty electrodes. Hard water deposits, oils, and organic matter are the most likely contaminants.

TABLE 1 - CELL CALIBRATION DATA

Temperature (°C)	Conductivity (umhos/cm)
15	1141.5
16	1167.5
17	1193.6
18	1219.9
19	1246.4
20	1273.0
21	1299.7
22	1326.6
23	1353.6
24	1380.8
25	1408.1
26	1436.5
27	1463.2
28	1490.9
29	1518.7
30	1546.7

For convenient normal cleaning, soak the electrodes for 5 minutes with a locally available bathroom tile cleaner such as: "Rally, Tile, Porcelain, and Chrome Cleaner"; Johnson Wax "Envy, Instant Cleaner"; or Lysol Brand "Basin, Tub, Tile Cleaner".

For storage cleaning, a 5 minute soak in a solution made of 10 parts distilled water, 10 parts isopropyl alcohol, and 1 part HCl can be used.

Always rinse the probe in distilled water after cleaning and before storage.

CAUTION: Do not touch the electrodes inside the probe. Platinum black is very soft and can be scraped off.

If cleaning does not restore the probe performance, re-platinizing is required.

3.2.2 Probe Replatinizing

1. Equipment required:

- a. YSI #3140 Platinizing Solution, 2 fluid ounce (3% platinum chloride dissolved in 0.025% lead acetate solution)
- b. YSI Model 33 meter
- c. 50 ml glass beaker or equivalent
- d. Distilled water

2. Procedure

- a. Clean probe as in section 3.2.1 - either method

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- b. Place the cell in the beaker and add sufficient YSI #3140 solution to cover the electrodes. Do not cover the top of the probe
- c. Plug the probe into the Model 33 and switch to the X100 scale to platinize the electrode
- d. Move the probe slightly to obtain the highest meter reading and continue platinizing for the appropriate time shown below:

<u>Meter Reading</u> (umhos/cm)	<u>Time</u> (minutes)
30,000	5
25,000	6
20,000	8
15,000	11
10,000	16

- e. After the elapsed time, remove the probe and rinse in distilled water.
- f. Return the solution to its container. Two ounces of solution should be sufficient for 50 treatments.

3.2.3 Storage

It is best to store conductivity cells in deionized water. Cells stored in water require less frequent platinization. Any cell that has been stored dry should be soaked in deionized water for 24 hours before use.

CALIBRATION AND MAINTENANCE PROCEDURES HAAKEBUCHLER pH STICK

1.0 INTRODUCTION

This procedure presents the steps for calibrating and maintaining the HaakeBuchler pH Stick. Instrument operation principles and procedures and specifications are presented in Procedure 5617003.

2.0 CALIBRATION

2.1 Calibration Solutions

The instrument requires distilled water, a pH 7 buffer solution, and a pH 4 buffer solution for calibration. To prepare the buffer solutions, dissolve the buffer powders provided with the instrument into the volume of distilled water specified on the buffer powder packets. (Note: the manufacturer does not specify whether buffer and pH 4 solutions, other than that provided, may be used as substitute solutions).

The pH of the buffer and pH 4 solutions will vary with the temperature of the solution. Use the table below to determine solution pH based on temperature.

Temp	0°C	10°C	20°C	25°C	30°C	40°C	50°C
pH 4	4.00	4.00	4.00	4.01	4.02	4.04	4.06
pH 7	7.11	7.06	7.01	7.00	6.98	6.97	6.97

2.2 Calibration Procedure

The instrument requires calibration in the field prior to each use. However, as a check of proper instrument function, the instrument should be periodically calibrated in the laboratory,

particularly if the instrument has been stored for an extended period without use.

To calibrate the instrument:

1. Remove the protective sheath and rinse the electrode in distilled water.
2. Place the electrode in the pH 7 buffer solution, depress the white operation button below the LCD display and allow the reading to stabilize.
3. Adjust pH 7 control using the tool on the end of the protective sheath. The pH 7 control is the upper most white control on the right side of the instrument. Adjust the pH control until the meter reads pH 7.
4. Rinse the electrode in distilled water.
5. Place the electrode in pH 4 solution, depress the white operation button, and allow the reading to stabilize.
6. Adjust the slope control (white control below pH 7 control on the right side of the instrument) until the meter reads the correct value of the pH 4 solution.
7. Rinse the probe in distilled water.
8. Repeat steps 2 through 7.
9. Record calibration on the instrument log form.
10. Store instrument properly.

3.0 MAINTENANCE

3.1 Storage

To maintain high accuracy and to obtain a long electrode life, the pH stick must be stored correctly when not in use. Always rinse the electrode in distilled water before replacing it in its protective sheath. The electrode must not be let to dry out.

The absorbent pad at the bottom of the sheath must be kept saturated with a pH 7 buffer solution. If this is not available, distilled water can be used as a temporary measure. Replace distilled water with buffer solution at the earliest possible opportunity. Always place buffer (or distilled water) into sheath following each use.

To retain accuracy and speed of response, the insulation of the connectors on the electrode and the body must be kept clean and dry. This is best assured by not unnecessarily removing the electrode from the body.

When not in use, place the pH stick in the wallet provided and store in a dry place.

3.2 Electrode Cleaning

If rinsing the electrode in distilled water is not deemed sufficient to clean the electrode, it can be cleaned in a N/10 HCl acid solution. Following cleaning in the acid, the electrode should be soaked in a pH 7 buffer solution for 24 hours before rinsing. Record cleaning on instrument's log form.

3.3 Battery

Normal battery life is in excess of 200 hours of continuous use. Cells should be replaced at 2 year intervals or earlier if exhausted (voltage per cell of less than 1.35V). Replacement cells must be mercury type V312H or direct equivalent. When refitting cells, make sure they are refitted in the manner illustrated on the battery housing.

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CALIBRATION PROCEDURE FOR THE HNU PI 101

1.0 INTRODUCTION

1.1 Content

This procedure presents the steps required to calibrate the HNU Model PI 101 photoionization analyzer. This instrument should be calibrated after each field use or prior to each field use if the instrument has not been calibrated during the previous 14 calendar days. The principle of detection and operating procedures are described in Procedure 5607001. This procedure presents calibration steps only.

1.2 Equipment

- o Calibration Gas (2 ranges)

Low range 0-20 ppm and mid range 20-200 ppm Isobutylene gas for standard field operation when contaminants are unknown or a mixture of gases is present. Isobutylene is the gas used for general calibration because of the instrument's relatively high sensitivity to it and the non-toxic nature of the gas.

Note: A specialty gas may be required if a single atmospheric contaminant is present and the contaminant has a sensitivity different from that of the calibration gas. See procedure for 5607001 for a discussion on specialty calibration.

- o Tubing and fittings (See Figure 1).
- o Rotameter or bubble flow meter.
- o Calibration Form F6264.
- o Table 1 for ionization potentials for compounds of interest.

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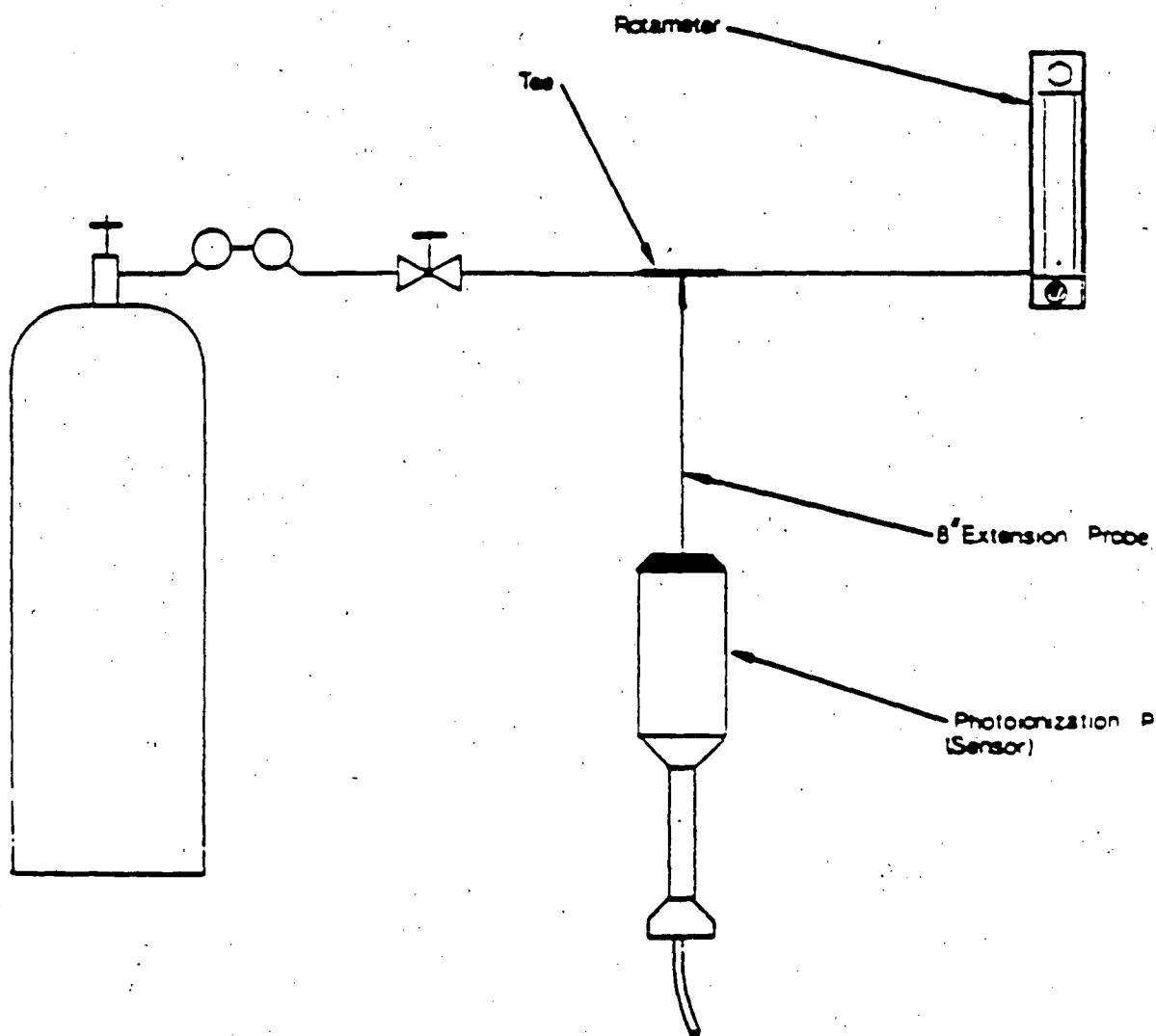


FIGURE 1 RECOMMENDED CALIBRATION PROCEDURE FOR PHOTOIONIZATION ANALYZER

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TABLE 1 RELATIVE SENSITIVITIES FOR VARIOUS GASES
(10.2 eV Lamp)

Species	Photoionization Sensitivity*
p-xylene	11.4
m-xylene	11.2
benzene	10.0 (reference standard)
toluene	10.0
diethyl sulfide	10.0
diethyl amine	9.9
styrene	9.7
trichloroethylene	8.9
carbon disulfide	7.1
isobutylene	7.0
acetone	6.3
tetrahydrofuran	6.0
methyl ethyl ketone	5.7
methyl isobutyl ketone	5.7
cyclohexanone	5.1
naptha (85% aromatics)	5.0
vinyl chloride	5.0
methyl isocyanate	4.5
iodine	4.5
methyl mercaptan	4.3
dimethyl sulfide	4.3
allyl alcohol	4.2
propylene	4.0
mineral spirits	4.0
2,3-dichloropropene	4.0
cyclohexene	3.4
crotonaldehyde	3.1
acrolein	3.1
pyridine	3.0
hydrogen sulfide	2.8
ethylene dibromide	2.7
n-octane	2.5
acetaldehyde oxime	2.3
hexane	2.2
phosphine	2.0
heptane	1.7
allyl chloride (3-chloropropene)	1.5
ethylene	1.0
ethylene oxide	1.0
acetic anhydride	1.0
α -pinene	0.7
dibromochloropropane	0.7
epichlorohydrin	0.7
nitric oxide	0.6

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TABLE 1 RELATIVE SENSITIVITIES FOR VARIOUS GASES
(10.2 eV Lamp) (Continued)

Species	Photoionization Sensitivity*
b-pinene	0.5
citral	0.5
ammonia	0.3
acetic acid	0.1
nitrogen dioxide	0.02
methane	0.0
acetylene	0.0

*Expressed in ppm (v/v).

2.0 CALIBRATION PROCEDURE

2.1 CDM employs a two-point standardization procedure to facilitate proper instrument calibration over the 0-20 ppm and 20-200 ppm operating ranges. Two distinct mixtures of the calibration gas (isobutylene) in air are used. Each mixture should give a 3/4 scale deflection in its respective operating range.

2.2 Instrument Setup.

2.2.1 Remove Instrument cover by pulling up on the side straps.

2.2.2 Prior to calibration, check the function switch (Figure 2) on the control panel to make sure it is in the OFF-position. The probe nozzle, is stored inside the instrument cover. Remove cover plate by pulling up on the pins that fasten the cover plate.

2.2.3 Remove the nozzle from the cover. Assemble probe by screwing nozzle into casing.

2.2.4 Attach probe cable to instrument box by inserting 12 pin interface connector of the probe cable into the connector on the instrument panel. Match the alignment keys and insert connector. Turn connector in clockwise direction until a distinct snap and lock is felt.

2.2.5 Turn the function switch to the Battery Check position. When the battery is charged, the needle should read within or above the green battery arc on the scale plate. If the needle is below the green arc or the red LED light

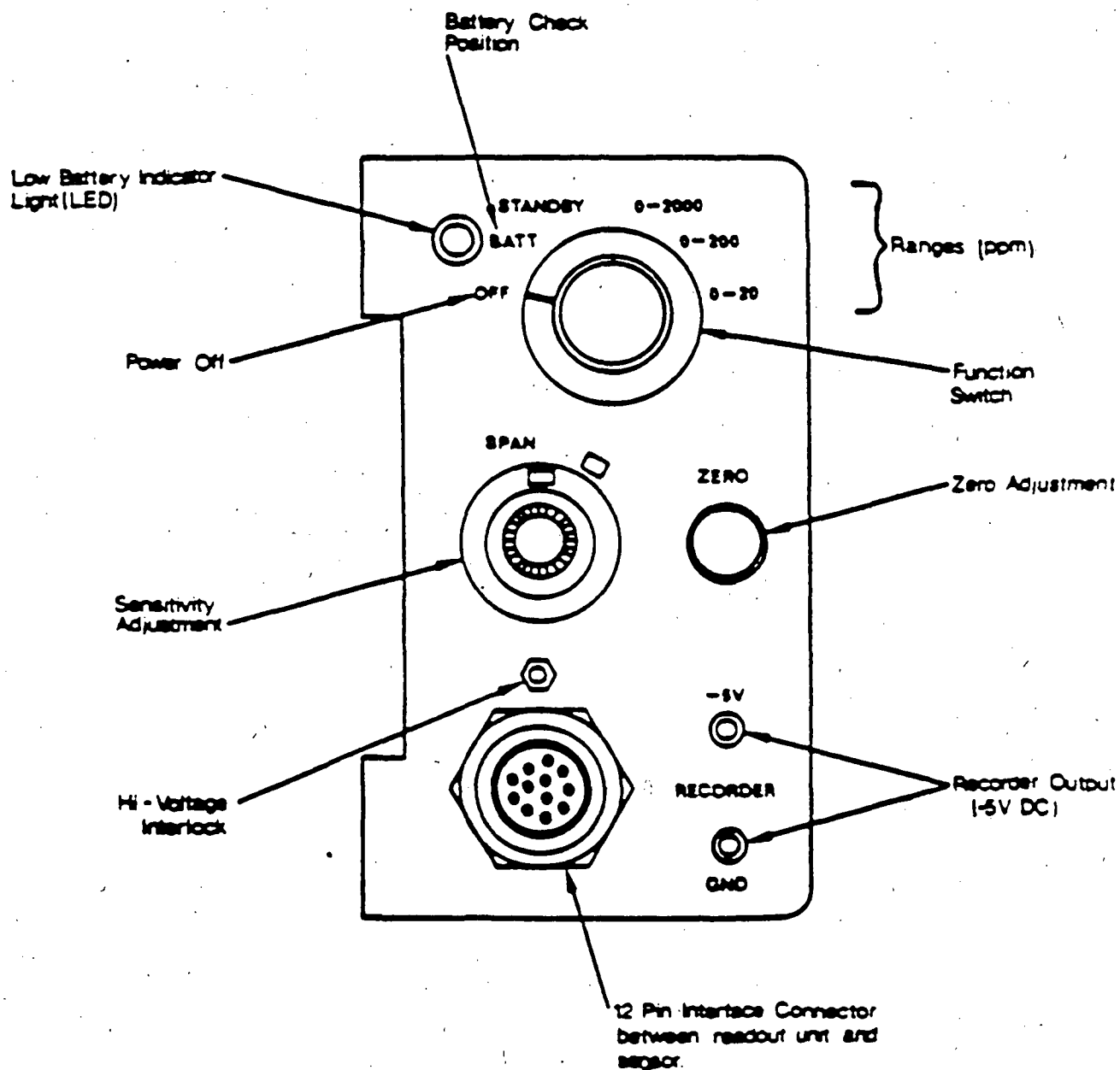


FIGURE 2 CONTROL PANEL FEATURES

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comes on, the instrument should be recharged prior to making any measurements. Implement step 3.0 to recharge battery.

- 2.2.6 Turn the function switch to the ON position. In this position, the UV light source should be on. To verify, gaze at the end of the probe for a purple glow. Do not look directly at the lamp itself. If the lamp does not come on refer to maintenance step 4.1.2.
- 2.2.7 To zero the instrument, turn the function switch to the standby position and rotate the zero potentiometer until the meter reads zero. Clockwise rotation of the zero potentiometer produces an upscale deflection while counter clockwise rotation yields a downscale deflection. (Note: no zero gas is needed since this is an electronic zero adjustment.) If the span adjustment is changed during instrument calibration, the zero should be rechecked and adjusted. If necessary wait 15 to 20 seconds to ensure that the zero reading is stable. Readjust as necessary.

2.3 Calibration Steps

- 2.3.1 Insert one end of T tube (Figure 1) into probe. Insert second end of probe into calibration gas in the 20-200 ppm range. The third end of probe should have the rotometer (bubbler) attached.
- 2.3.2 Set the function switch in the 0-200 ppm range.

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- 2.3.3 Crack the valve on the pressured calibration gas container until a slight flow is indicated on the rotometer. The instrument will draw in the volume required for detection with the rotometer indicating excess flow.
- 2.3.4 Adjust the span potentiometer so that the instrument is reading the exact value of the calibration gas.
(Calibration gas value is labeled on the cylinder).
- 2.3.5 Turn instrument switch to the standby position and check the electronic zero. Reset zero potentiometer as necessary following step 2.3.7.
- 2.3.6 Record on form F6264 all original and readjusted settings as specified in the form.
- 2.3.7 Next, set the function switch to the 0-20 ppm. Remove the mid range (20-200 ppm) calibration gas cylinder and attach the low range (0-20 ppm) calibration gas cylinder as described above.
- 2.3.8 Do not adjust the span potentiometer. The observed reading should be ± 3 ppm of the concentration specified for the low range calibration gas. If this is not the case, recalibrate the mid range scale repeating procedures 3.3.1 to 3.2.7 above. If the low range reading consistently falls outside the recommended tolerance range, the probe light source window likely needs cleaning. Clean window following step 4.1.3. When the observed reading is within the required tolerances, the instrument is fully calibrated.

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2.3.9 Complete forms F6264 and F6265 for the respective instrument being calibrated.

3.0 BATTERY RECHARGING

- 3.1 Place plug on end of charger cable into jack on left side of instrument case
- 3.2 Plug charger into 120V AC supply.
- 3.3 To ensure that charger is functioning, turn the function switch to the battery check position. The meter should go upscale if the charger is working correctly and correctly inserted.
- 3.4 The battery is completely charged overnight (ca, 14 hours).
- 3.5 When disconnecting charger, remove from 120 V AC before removing mini phone plug.

4.0 TROUBLE SHOOTING AND MAINTENANCE

4.1 General Fault Determination and Correction

- 4.1.1 Battery level is low. Recharge if necessary implementing step 3.0. If the battery will not recharge it will have to be replaced.
- 4.1.2 UV lamp function. Gaze at sample inlet when mode switch is on an instrument function position and observe for purple glow of lamp. If the lamp does not glow in any of the three instrument function positions, it may be burned out and will have to be replaced. To replace the lamp:

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1. Turn the function switch to the off position and disconnect the probe connector from the readout unit.
2. Remove the exhaust screw found near the base of the probe (Figure 3).
3. Grasp the end cap in one hand and the probe shell in the other and gently pull to separate the end cap and lamp housing from the shell.
4. Loosen the screws on the top of the end cap and separate the end cap and ion chamber from the lamp and lamp housing. Care must be taken so that the ion chamber does not fall out of the end cap and the lamp does not slide out of the lamp housing.
5. Turn the end cap over in your hand and tap on the top of it; the ion chamber should fall out of it.
6. Place one hand over the top of the lamp housing and tilt slightly. The light source will slide out of the housing.
7. Replace lamp with one of same energy source as the one removed by sliding it into the housing. Note: the amplifier board and instrument circuitry are calibrated for one light energy source. Insertion of a lamp of a different energy level will produce false instrument readings.
8. Place the ion chamber on top of the lamp housing, checking to ensure that the contacts are aligned.
9. Place the end cap on top of the ion chamber and replace the two screws. The screws should be tightened only enough to seal the "O" ring. Do not overtighten.
10. Line up the pins on the base of the lamp housing with the pins inside the probe shell. Gently slide the housing assembly into the probe shell. Do not force the assembly as it only fits one way.
11. Replace and tighten the exhaust screw.
12. Reconnect the 12 pin connector and turn instrument mode switch to a function position. Check for glow of lamp. If lamp still does not function the instrument has an electrical short or other problem that will have to be corrected at the factory.

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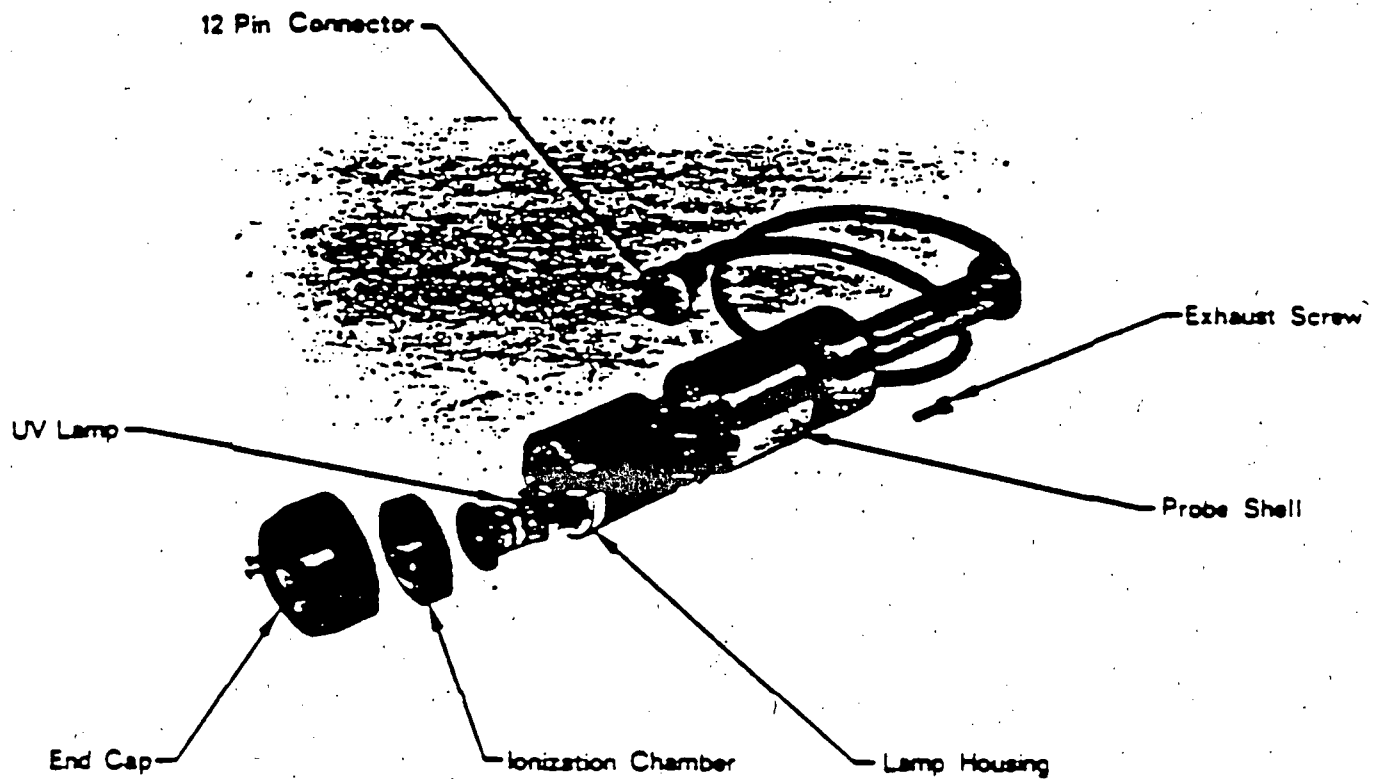


FIGURE 3 COMPONENT PARTS OF PROBE

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4.1.3 Instrument appears to be functional, but responses are lower than expected or erratic. The window of the light source may be dirty and need to be cleaned. To clean the light source window:

1. Disassemble the probe assembly by repeating steps 1 through 6 under 4.1.2 above.
2. Clean the window of the light source using compound provided with instrument and soft clean cloth.
Important: use cleaning compound on the window of the 10.2 eV lamp only. The cleaning compound may damage the windows of the 9.5 and 11.7 eV lamps.
3. Reassemble the probe assembly repeating step 7 through 12 above.

4.2 Specific Faults

4.2.1 No meter response in any switch position (including BATT CHK)

1. Broken meter movement: Tip instrument rapidly from side to side. Meter needle should move freely, and return to zero.
2. Electrical connection to meter is broken: Check all wires leading to meter and clean the contacts of quick-disconnects.
3. Battery is completely dead: Disconnect battery and check voltage with a volt-ohm meter.
4. Check 2 amp fuse.
5. If none of the above solves the problem, consult the factory.

4.2.2 Meter responds in BATT CHK position, but reads zero or near zero for all others.

1. Power supply defective: Check power supply voltages per Figure 4. If any voltage is out of specification, consult the factory.
2. Input transistor or amplifier has failed: Rotate zero control; meter should deflect up/down as control is turned. Open probe; both transistors should be fully seated in sockets.
3. Input signal connection broken in probe or readout: Check input connector on printed circuit board. Should be firmly pressed down. Check components on back side of printed circuit board. All connections should be solid, and no wires should touch any other object. Check all wires in readout for solid connections.

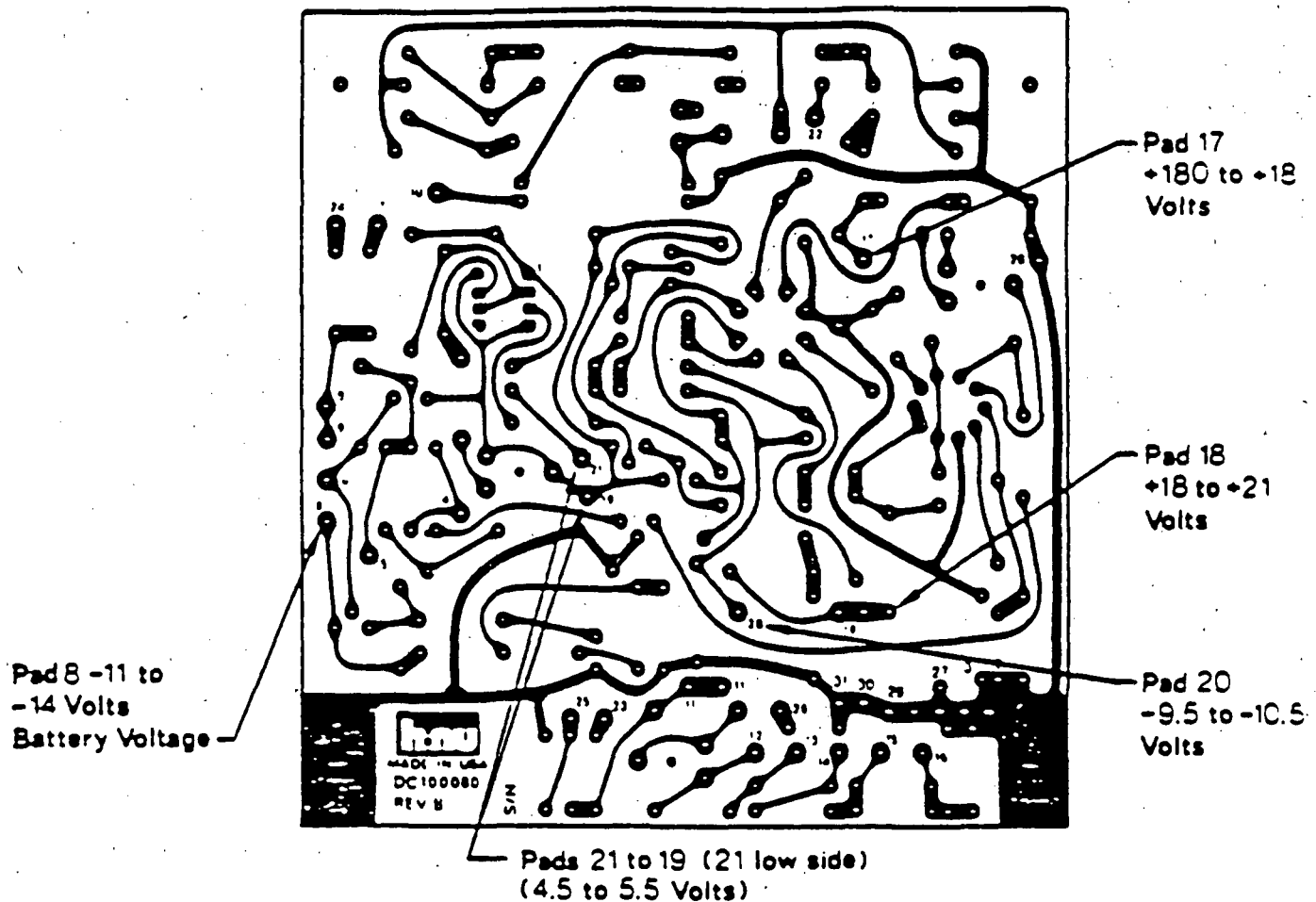
4.2.3 Instrument responds correctly in BATT CHK, and STBY, but not in measuring mode.

1. Check to see the light source is on (See Section 4.1.2).
2. Check high voltage power supply (see Figure 4).
3. Open end of probe, remove lamp and check high voltage on lamp contact ring.
4. If high voltage is present at all above points, light source has most likely failed. Consult the factory.

4.2.4 Instrument responds correctly in all positions, but signal is lower than expected.

1. Check span setting for correct value.
2. Clean window of light source (See 4.1.3).
3. Double check preparation of standards.
4. Check power supply 180 V output. See Figure 4.
5. Check for proper fan operation. Check fan voltage. See Figure 4.
6. Rotate span setting. Response should change if span pot is working properly.

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All Voltages Respect to Ground							
pads	voltage	pads	voltage	pads	voltage	pads	voltage
1	- 5.7V	9	- 12.2V	17	180V	25	0
2	GRD	10	- 12.1V	18	+ 19.4V	26	0
3	GRD	11	0	19	- 10.6V	27	GRD
4	-10.7V	12	0	20	- 9.7V	28	0
5	- 11.3V	13	0	21	- 14.5V	29	GRD
6	- 12.1V	14	0	22	- 400V	30	GRD
7	0	15	0	23	0	31	GRD
8	- 12.2V	16	0	24	0		

Figure 4 Power Supply PC Board

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4.2.5 Instrument responds in all switch positions, but is noisy (erratic meter movement).

1. Open circuit in feedback circuit. Consult the factory.
2. Open circuit in cable shield or probe shield. Consult the factory.

4.2.6 Instrument response is slow and/or irreproducible.

1. Fan operating improperly. Check fan voltage. See Figure 4.
2. Check calibration and operation.

4.2.7 Low battery indicator.

1. Indicator comes on if battery charge is low.
2. Indicator also comes on if ionization voltage is too high.

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CALIBRATION AND MAINTENANCE PROCEDURES CENTURY SYSTEMS PORTABLE ORGANIC VAPOR ANALYZER MODEL OVA-128

1.0 INTRODUCTION

This procedure presents steps required to calibrate and maintain the model OVA-128 organic vapor analyzer. Specifications and operating principles and procedures are presented in Procedure 5607003.

2.0 CALIBRATION

2.1 General

The OVA is capable of responding to nearly all organic compounds. However, the response will vary from compound to compound. The responses of some compounds relative to methane, are presented in Table 1. For precise analyses it is necessary to calibrate the instrument to a specific compound of interest, particularly if that compound contains elements other than carbon and hydrogen. For general use, the instrument is calibrated to methane.

Internal electronic adjustments are provided to calibrate and align the electronic circuits. There are four such adjustments, all located on the electronics board. One adjustment potentiometer, R-38, is factory set and is used to set the power supply voltage. Potentiometer R-38 thus should never be adjusted. The remaining three adjustments, R-31 (X1), R-32 (X10), and R-33 (X100) are used for setting the electronic amplifier gain for each of the three calibration ranges. Access to the adjustments is accomplished by removing the instrument from its case.

TABLE 1 - RESPONSE OF OVA TO HYDROCARBONS RELATIVE TO METHANE

Compound	Relative Response (%)
Methane	100 (Reference)
Propane	64
N-butane	61
N-pentane	100
Ethylene	85
Acetylene	200
Benzene	150
Tolvene	120
Ethane	90
Acetone	60
Methyl Ethyl Ketone	80
Methyl Isobutyl Ketone	100
Methyl Alcohol	15
Ethyl Alcohol	25
Isopropyl Alcohol	65
Carbon Tetrachloride	10
Chloroform	65
Trichloroethylene	70
Vinyl chloride	35

2.2 Methane Calibration

2.2.1 Equipment

- o Calibration gas (100 ppm methane)
- o T-tube assembly

2.2.2 Instrument Startup

Start instrument by:

1. Move PUMP switch to ON and check battery condition by moving the INSTR switch to the BATT position.

Recharge battery (section 3.0) if battery level is low.

2. Move INSTR switch to ON and allow 5 minutes for warmup.
3. Place instrument in vertical position and check flow rate.
4. Open the H₂ TANK VALVE and H₂ SUPPLY VALVE.
5. Depress Ignitor button for 6 seconds or until hydrogen ignites, whichever is shorter. If hydrogen fails to ignite, wait 2 minutes and attempt to ignite hydrogen.
6. Once lit, wait 5 minutes for instrument to stabilize before starting calibration procedure.
7. Open instrument cover to expose circuit board.

2.2.3 Calibration

Calibration should be performed in a well ventilated area.

1. Set CALIBRATE switch to X10.
2. For methane calibration the GAS SELECT control should be set to 300. Check to ensure that this control is set at 300.
3. Adjust meter reading to zero by rotating the Calibrate ADJUST (zero) knob.
4. Attach one end of T assembly to methane gas cylinder and the other to the probe.
5. Crack open methane gas cylinder until a slight flow of gas can be detected exiting the open end of the T assembly.
6. Adjust trimpot R-32 on circuit board so that meter reads the equivalent of the calibration gas concentration. This sets the instrument gain for methane with the panel mounted gain adjustment set at 300.

7. Close methane gas cylinder. Turn off H₂ SUPPLY VALVE to put out flame. Wait for flameout alarm to sound to ensure the flame is out.
8. Leave CALIBRATE switch on the X10 position and use CALIBRATE ADJUST (zero) knob to adjust meter reading to 4 ppm.
9. Place CALIBRATE switch in X1 position and, using trimpot R-31 on circuit board, adjust meter reading to 4 ppm. This is the Bias Adjustment for the X1 range.
10. Move CALIBRATE switch to X10 position again. Use CALIBRATE ADJUST (zero) knob to adjust meter to a reading of 40 ppm.
11. Move CALIBRATE switch to X100 position and use trimpot R-33 on circuit board to adjust meter reading to 40 ppm.
12. Move CALIBRATE switch to X10 position and use CALIBRATE ADJUST (zero) knob to adjust meter reading to zero.
13. Unit is now balanced from range to range, calibrated to methane, and ready to be placed in normal service.
14. Shut instrument down by ensuring that the H₂ SUPPLY VALVE and H₂ TANK VALVE are closed and the INSTR and PUMP switches are in the OFF position.
15. Record on instrument calibration label, calibration date, gas, and initials of person performing calibration. Remove old tag and replace it with updated label. Fill out instrument history log form.

2.3 Calibration to Specialty Gas/Vapor

Primary calibration of the instrument is accomplished using a known mixture of a specific gas or vapor.

2.3.1 Equipment

- o Calibration (span) gas (75-90ppm of known gas or vapor)
- o T-tube assembly

2.3.2 Instrument Startup

Follow steps in 2.2.2 above.

2.3.3 Calibration

Calibration should be performed in a well ventilated area.

1. Set CALIBRATE switch to 10.
2. Adjust meter reading to zero by rotating the CALIBRATE ADJUST (zero) knob.
3. Attach one end of T assembly to calibration gas cylinder and the other to the probe.
4. Crack open calibration gas cylinder until a slight flow of gas can be detected exiting the open end of the T assembly. (Caution: if the calibration gas is toxic or highly flammable, calibration should occur underneath a hood.)
5. Adjust GAS SELECT knob on instrument until the meter reads the same level as that of the calibration gas.
6. Turn off calibration cylinder and remove T assembly.
7. The instrument is now calibrated for the specialty gas/vapor. All responses of the instrument should be recorded relative to the specialty gas.
8. Calibration in the X10 range by adjusting the GAS Select knob automatically calibrates the instrument for the X1 and X100 ranges. No further adjustments are necessary.
9. Shut instrument down by closing the H₂ SUPPLY VALVE and H₂ TANK VALVE, and putting the INSTR and PUMP switches in the OFF position.
10. Record in instrument calibration label calibration date, span gas and concentration, span setting, and initials of person performing calibration. Remove old

tag and replace it with updated label. Fill out instrument history log.

3.0 FILLING OF HYDROGEN SUPPLY

The instrument should be completely shut down for hydrogen tank refilling. The refilling should be done in a ventilated area. There should be no potential ignitors or flame in the area.

1. Attach filling hose to external source of hydrogen. Pure hydrogen of 1,600 to 2,300 psi will be required.
2. Crack open valve on hydrogen supply, place FILL/BLEED valve on hose in FILL position and purge hose for 2-3 seconds.
3. Close FILL/BLEED Valve (OFF position) and immediately attach other end of fill hose to instrument fill connection and tighten the connection.
4. Open supply valve external on hydrogen tank 1/2 to 1 turn. Set regulator to 1,600 to 2,300 psi.
5. Open the REFILL Valve and the H₂ Tank VALVE on the instrument.
6. Place FILL/BLEED Valve in FILL position. The instrument hydrogen tank should now be filling.
7. The instrument H₂ Pressure Indicator should now indicate instrument tank pressure. This pressure should approximate that of the external supply tank regulator gauge.
8. After the instrument tank is filled, shut off:
 - a. The REFILL VALVE on the instrument panel.
 - b. The FILL/BLEED Valve on the filling hose assembly.
 - c. The valve on the external hydrogen supply bottle.
9. The supply hose and internal lines on the instrument now contain hydrogen under pressure. To reduce this pressure to atmospheric pressure:
 - a. Turn FILL/BLEED Valve to BLEED position until gas can no longer be heard escaping.

- b. Turn FILL/BLEED Valve to FILL position to allow gas trapped in the connective fittings to go into the hose assembly.
 - c. Turn FILL/BLEED Valve to BLEED position to bleed off this pressure.
 - d. Turn FILL/BLEED Valve to OFF position. Keep valve in OFF position.
10. Close H₂ Tank Valve.
 11. Remove fill hose from instrument. Any gas still under pressure will escape as the connector is removed. Release of gas should only be momentary.
 12. As a check of the integrity of the instrument's hydrogen supply system, observe the H₂ TANK PRESSURE Indicator with the system shut down. Release of internal pressure should not go down rapidly. If there is a rapid decrease (greater than 350 PSIG/hour) with the instrument in shut down mode, there is a significant leak in the H₂ supply system. If so, the instrument should be returned to the manufacturer for repairs.

4.0 BATTERY RECHARGING

The battery should be recharged following each use of 4 hours or more, or when the battery check indicator indicates need of a charge. Never charge instrument in hazardous environment or when refilling hydrogen tank.

1. Remove cover from battery charge part on instrument.
2. Plug charger BNC connector into mating connector on battery cover and insert AC plug into 115 VAC wall outlet.
3. Move battery charger switch to the ON position. The light above the switch should illuminate.
4. Battery charge condition is indicated by the meter on the front panel of the charger; meter will deflect to the right while charging. When fully charged, the pointer will be in line with the charged mark above the scale.
5. Approximately 1 hour of charging time is required for each hour of operation; 12 hours for complete charge. Do not charge for more than 24 hours.

5.0 MAINTENANCE

5.1 General

Section 6.0 of the Model OVA-128 Instruction and Service Manual contains detailed maintenance and repair procedures for servicing the OVA. These procedures are not repeated here. Equipment managers are referred to the manual for repair of the OVA.

Equipment managers should be thoroughly familiar with instrument operation before performing maintenance. It is essential that all safety considerations regarding use and maintenance of this instrument be understood. There should be no potential igniters or flame in the area when filling, emptying, or purging the hydrogen system and the instrument should be in shut-down mode.

5.2 Trouble Shooting

Table 2 presents common problems and corrective actions for repairing the instrument.

6.0 REFERENCE

Foxboro Analytical. No date. Instruction and Service Manual, Century Systems Portable Organic Vapor Analyzer Model OVA-128 (M1 2R900AC).

TABLE 2

TROUBLE	TROUBLE SHOOTING PROCEDURE	REMEDY
1) Low sample flow rate on flow indicator	<ul style="list-style-type: none"> a) Check tellon tubing on valve assembly for kinks, etc. b) Check flow rate with valve in down position. 	<p>Straighten or replace tellon tubing</p> <p>Check for over restriction of charcoal filter</p>
2) H ₂ flame will not light	<ul style="list-style-type: none"> a) Check column connections on top of unit to make sure they are tight. b) Check column for sharp bends or kinks. (If hydrogen flows through this column at all times and a sharp bend will compact packing too tightly for proper hydrogen flow.) c) Check charcoal filter fittings to make sure they are tight. d) Check H₂ flow rate from the column. e) Check that the Inject and Backflush Valves are both completely in or out. A partially activated valve will block the H₂ and air flow paths. f) If a new column was installed prior to problem identification, check for proper hydrogen flow rate through the column (should be approximately 12 cc/minute). Reference paragraph 7.1.4.2d. 	<p>Tighten fittings</p> <p>Replace column</p> <p>Tighten fittings</p> <p>Adjust hydrogen pressure to obtain 12 cc/min. flow rate. Ensure both valves are either completely in or out.</p> <p>Increase hydrogen pressure to obtain proper hydrogen flow rate or if column is excessively restrictive, replace or repack the column.</p>
3) Ambient background reading in clean environment is too high	<ul style="list-style-type: none"> a) Check for contamination in charcoal filter assembly. This can be detected if ambient reading increases when going in to the chromatographic mode. Reference paragraph 7.1.5.2b. b) Check for contamination in column. Reference paragraph 7.1.5.2a c) Check for contamination in column valve assembly. 	<p>Replace activated charcoal in charcoal filter assembly.</p> <p>Replace or clean column.</p> <p>Remove valve stems and wipe with clean lint-free cloth. Heat valve assembly during operation to vaporize and remove contaminants.</p>
4) Flame-out when operating either valve	<ul style="list-style-type: none"> a) Ensure valves are being operated with a quick, positive motion. b) Either H₂ or air may be leaking around one or more of the valve quad rings. Assess by tests and "O" ring inspection. c) Damaged or worn quad rings causing leak. 	<p>Operate valve with a positive motion.</p> <p>Remove stems and lightly coat with silicone grease, only on contact surface of the "O" ring. Wipe off excess (do not remove quad rings).</p> <p>Replace quad rings and grease as above.</p>
5) Excessive peak tailing	<ul style="list-style-type: none"> a) Change or clean GC column and see if problem disappears. b) Inspect GC valves for excessive silicone grease or contamination. 	<p>Ensure columns are clean prior to use. Refer to paragraph 7.1.5.2 a for cleaning instructions. If one of a same type of column tails worse than others, repack the column or discard.</p> <p>Excessive lubricant or foreign matter in the valve assembly can cause excessive tailing. Clean valve assemblies and lightly relubricate as required. Lubricant should be put only on the outside contact surface of the "O" ring. Do not get grease into "O" ring.</p>

**FINAL
SOUTHEAST ROCKFORD
GROUNDWATER CONTAMINATION
SOURCE CONTROL OPERABLE UNIT
SAMPLING AND ANALYSIS PLAN
ADDENDUM**

FEBRUARY 1996

Prepared For:

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Section One

1.0 INTRODUCTION

1.1 OBJECTIVES OF SAMPLING PROGRAM

This Sampling and Analysis Plan (SAP) describes the field activities required for the Southeast Rockford Groundwater Contamination Source Control Operable Unit (SCOU) study. The objectives of the sampling program are as follows:

- Evaluate potential source areas (Areas 4, 7, 9, 10 and 11) defined in Phases I and II;
- Collect data to support source remediation; and
- Establish soil cleanup levels.

1.2 SAMPLING TEAM RESPONSIBILITIES

Field sampling will be performed by Camp Dresser & McKee (CDM). The project organization chart is shown in the Southeast Rockford SCOU Quality Assurance Project Plan (QAPP) Addendum. Responsibilities of the sampling team are described below.

Field Manager

The Field Manager (FM) will be responsible for assigning the sampling team responsibilities (in conjunction with the Site Manager), as well as overseeing all field activities. The FM will coordinate mobilization and demobilization for the CDM sampling team, as well as for any subcontractors. The FM will be responsible for keeping the Site Manager up to date on all

sampling and subcontractor activities.

Sampling Team Leader

The Sampling Team Leader (STL) will be responsible for the sampling efforts, will assure the availability and maintenance of all sampling equipment and materials, and will maintain an adequate supply of shipping and packing materials. The STL will supervise the completion of all chain-of-custody records, the proper handling and shipping of the samples collected, be responsible for the accurate completion of field log books, and provide close coordination with the Field Data Coordinator (FDC) and the Field Manager (FM). The STL or FM will be present whenever samples are collected.

Sampling Team Member(s)

The Sampling Team Member(s) (STM) will perform field measurements, collect samples, prepare samples for shipping, and decontaminate sampling equipment as directed by the STL.

Field Data Coordinator

The Field Data Coordinator (FDC) will remain in the support area and will accept custody of samples from the sampling team. The FDC will be responsible for the completion of all chain-of-custody and sample traffic control forms. The FDC will also be responsible for maintaining communications with on-site personnel and off-site laboratory personnel, as well as for logging all communications and site entries and departures.

Site Health and Safety Coordinator (SHSC)

The SHSC is responsible for daily supervision and documentation of all safety, decontamination, environmental monitoring and field medical monitoring activities. The SHSC is responsible for assuring that all field personnel comply with the provisions of the CDM Health and Safety Assurance Manual and site Health and Safety Plan. The SHSC has the authority to suspend site work if conditions become unsafe, if HSAM/HSP requirements are not met, or if he/she determines that an upgraded level of protection may be required. The SHSC is responsible for designating and marking restricted areas during various site activities and for redesignating these areas when it is appropriate to do so.

Safety Technician

The Safety Technician (a designated member of the sampling team) will assist with sampling, aid other sampling team members with the donning and doffing of protective clothing, decontamination of sample containers and equipment, and will be available to replenish miscellaneous supplies, such as ice and vermiculite, as needed. The Safety Technician will report directly to the SHSC in health and safety related duties and will assume the responsibilities of the SHSC in the event of his/her absence from the site or in an emergency.

1.3 SCOPE OF SAMPLING ACTIVITIES

The scope of sampling activities detailed by this plan include various phases of collection and analysis that will be performed during this investigation. 150 soil samples will be collected for chemical analysis during the advancing of an estimated 298 soil gas probes; additional soil samples will be collected for lithological and chemical analysis during the advancement of thirteen deep soil borings. A maximum of ten surface soil samples will be collected at locations determined in the field based on the results of the soil gas sampling. In

four sediment and three surface water samples will be collected from the creek which runs along the northern boundary of Area 7.

Table 1-1 is a summary of the sampling and analysis program. The numbers of borings and samples installed or collected during the SCOU will depend on the results of certain ongoing field activities (including soil gas and Geoprobe work); as a result, the actual numbers of borings and samples installed or collected will likely vary somewhat from those given in this SAP, or in the Work Plan and QAPP.

**SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT**

Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Samples ¹	QC Samples		
				Field Duplicates	Field Blank	Matrix Total
Subsurface soil samples collected during geo-probe work	Qualitative organic vapor screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	150	8	-	158
		CLP RAS B/N/A Extractables ^{2,5}	88	5	-	93
		CLP RAS Pesticides/PCBs ^{2,5}	88	5	-	93
Deep soil borings - Soils collected during drilling	Qualitative organic vapor screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	19	1	-	20
		CLP RAS Metals and Cyanide ^{3,4}	12	1	-	13
Area 7 Creek Sediment	Qualitative screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	4	1	-	5
		CLP RAS B/N/A Extractables ^{2,5}	4	1	-	5
		CLP RAS Pesticides/PCBs ^{2,5}	4	1	-	5
Area 7 Surface Water	pH, conductivity, temperature	CLP RAS Volatile Organics ^{2,5}	3	1	1	5
		CLP RAS B/N/A Extractables ^{2,5}	3	1	1	5
		CLP RAS Pesticides/PCBs ^{2,5}	3	1	1	5
Surface Soil	Qualitative organic vapor screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	20	1	-	21
		CLP RAS B/N/A Extractables ^{2,5}	20	1	-	21
		CLP RAS Pesticides/PCBs ^{2,5}	20	1	-	21
		CLP RAS Metals and Cyanide ^{3,4}	20	1	-	21
Soil Gas Samples	Field GC for 1, 2-DCE, TCA, TCE, PCE, VC, and BETX		298	0	60	358

1. Frequency of collection for all investigative and QC samples is 1.
2. Contract Laboratory Program Routine Analytical Services (CLP RAS) volatile, extractable and pesticide/PCB compounds are listed in Tables 3-1 through 3-3 of the QAPP.
3. Contract Laboratory Program Routine Analytical Services (CLP RAS) inorganic parameters are listed in Table 3-4 of the QAPP.
4. No extra sample volume is required for soil matrix spike/matrix spike duplicate (MS/MSD) samples.

5. Samples collected for MS/MSD analysis will be collected at double the volume.
6. One trip blank will be shipped with each shipment of volatile organics (water samples only).
7. MS/MSDs will be collected at a frequency of one per group of 20 or fewer samples.
8. Field blanks for soil gas consist of rinseate blanks.

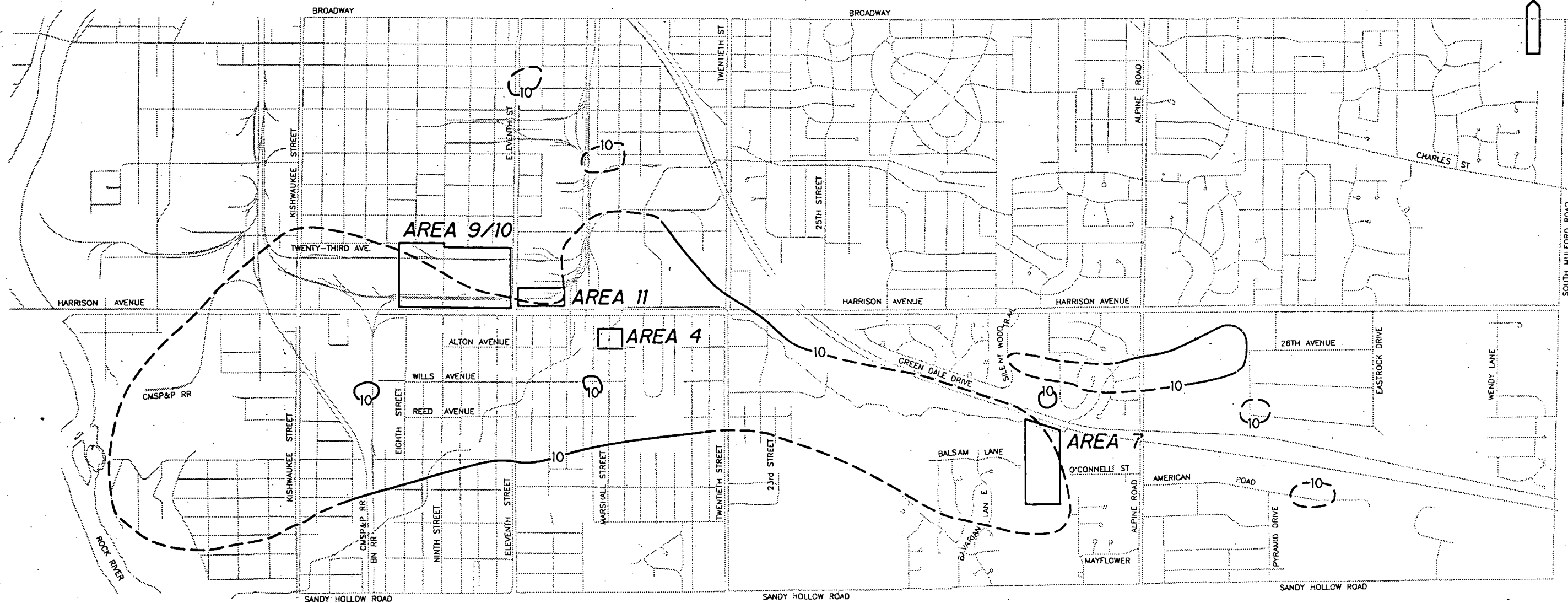


Section Two

2.0 PROJECT DESCRIPTION


The Phase I and II Remedial Investigations, both conducted by Camp Dresser & McKee Inc. (CDM) under the direction of the Illinois Environmental Protection Agency (IEPA), have identified several source areas of volatile organic compound (VOC) contamination in southeast Rockford, Illinois. The source areas of interest are Areas 4, 7, 9/10, and 11. These areas either contain or are likely to contain significant concentrations of VOCs that contribute to groundwater contaminant plumes delineated during the Phase I and II investigations. The primary objective of the Southeast Rockford Source Control Operable Unit (SCOU) is to provide detailed information to support source remediation and establish soil cleanup levels.

The study area description is provided in Section 2 of the Southeast Rockford SCOU Work Plan (August 1995). The study area is shown on Figure 2-1.

CDMenvironmental engineers, scientists,
planners, & management consultants

LEGEND:

- AREA 4 SOURCE AREAS TO BE STUDIED
- 10 — TOTAL HALOGENATED VOC CONTOUR (ug/L),
DASHED WHERE INFERRED

SCALE:

 500 0 1000 Feet

SOUTHEAST ROCKFORD
 SOURCE CONTROL OPERABLE UNIT
**GROUNDWATER CONTAMINATION
 STUDY AREA** Figure No. 2-1



Section Three

3.0 GENERAL SAMPLING INFORMATION

3.1 SAMPLE CONTAINERS AND PRESERVATION

All surface water and soil/sediment samples will be collected in laboratory-decontaminated sample bottles and jars provided by the IEPA Bottle Repository. At drilling locations (soil borings and geoprobes), and surface water and sediment sampling locations, concentrations of contaminants are anticipated to be either low or medium concentrations as designated by the USEPA Contract Laboratory Program. Sampling, handling and shipping of the samples will be performed in accordance with these anticipated concentrations. Sample containers and preservation will conform to the October 27, 1989 USEPA Region V Sample Handling Manual as found in Appendix A. The sample containers will meet the requirements given in, *Specifications and Guidance for Contaminant-Free Sample Containers*, EPA 540/R-93/051, December, 1992.

The sample containers and their preservation will be as follows:

Surface Water Samples

- Four 40-ml glass VOA vials will be collected at each surface water sampling location for volatile organics analysis.
- Three one-liter amber glass bottles will be used to collect surface water analyzed for base/neutral/acid extractable and pesticide/PCB compounds.
- At sample collection points where duplicate samples will be collected, double sample volume for volatile organics, extractables, and pesticides will be

supplied to the designated lab for analysis.

- At sample collection points where matrix spike/matrix spike duplicates (MS/MSD) samples will be collected, double sample volume for semivolatile analysis will be supplied to the designated laboratory.
- All water samples will be cooled at 4°C in an iced cooler following individual sample collection .

Soil Samples

In the following discussion, low- and medium-concentration samples refer to subsurface soil samples collected during drilling, surface soil and sediment samples.

- Low- and medium-concentration soil samples collected for metals and cyanide analysis will be collected in either one 8-oz. wide mouth glass bottle or two 4-oz. wide-mouth glass bottles.
- Low- and medium-concentration soil samples collected for semivolatiles will also be collected in either one 8-oz. or two 4-oz. bottles.
- Low- and medium-concentration soil samples collected for volatiles will be placed in two 120-ml wide-mouth glass jars.
- No extra sample volume will be collected for MS/MSD analysis.
- Duplicate samples will be collected at double volume for all parameters in their respective sample containers.

- All soil samples will be cooled to approximately 4°C in an iced cooler following individual sample collection.

A summary of soil and water sample bottles, their size and construction material, and sample matrix and holding times is given in Tables 3-1. QC requirements for analytical samples are discussed in detail in Section 7.

3.2 SAMPLE HOLDING TIMES

The sample holding times for soil and water samples are listed on Table 3-1. To expedite sample analysis, the samples will be shipped to the laboratory (CLP) via an overnight carrier (i.e., Federal Express) or delivered (ALS) on the day of sample collection, or the day after.

3.3 SAMPLE PACKAGING AND SHIPMENT

Following sampling, the sample bottle exteriors will be decontaminated near the sampling location, or rinsed with potable or distilled water prior to shipment. The Field Manager will help the Field Data Coordinator prepare documentation and package sample bottles for shipment according to the following procedures:

- Check for proper sample preservation; tighten sample bottle caps securely and seal with tape; mark liquid levels if bottles are partially full.
- Make sure traffic report labels and sample tags are securely attached to the sample container; place each container in a zip-loc baggie, ensuring that labels can be read.

TABLE 3-1

SAMPLE VOLUMES, CONTAINERS, AND PRESERVATION TECHNIQUES
LOW AND MEDIUM CONCENTRATION

<u>Analysis</u>	<u>Container</u>	<u>Preservative</u>	<u>Maximum Holding Time</u>	<u>Volume of Sample</u>	<u>Matrix</u>
Base/neutral/acid extractables, pesticides/PCBs	Three one-liter amber glass bottles with Teflon lined cap	Cool, 4°C	5 days until extraction. Analyze 40 days after extraction	Fill bottle to neck	Water
Volatiles	Four 40-ml volatile organic analysis (VOA) vials	2 drops concn. HCl to pH<2; cool, 4°C	7 days	Fill completely (no air bubbles)	Water
Semi-volatiles (extractables and pesticides/PCBs)	One 8-ounce glass wide mouth bottle with Teflon-lined cap	Iced to 4°C	14 days until extraction and analyzed within 40 days after extraction	Fill no more than 3/4 full	Soil
Volatiles	Two 120-ml glass wide-mouth vials with Teflon lined caps	Iced to 4°C	7 days	Fill completely (No Head Space)	Soil
Metals and Cyanide	One 8-ounce glass wide-mouth bottle	Iced to 4°C	180 days (28 days for mercury) and 12 days, respectively	Fill no more than 3/4 full	Soil

- Samples for medium hazard will be packaged one bottle per paint can, with the excess space filled with vermiculite. The sample number and proper DOT hazard classification will be marked on each can. Unknown samples will be marked "Flammable Solid N.O.S. UN1325". The cans will then be placed in coolers with the appropriate DOT labeling.
- Place containers in a cooler lined with two inches of vermiculite or equivalent absorbent material; maintain at 4°C with cold packs or ice sealed in plastic bags; fill remaining space in cooler with additional packing material.
- Place completed chain-of-custody forms and traffic reports in a zip-loc baggie and tape to inside of cooler lid.
- Close cooler and seal with strapping tape; if cooler has a drain port, seal it with tape; place one custody seal across closure at front of cooler and across hinge area at back of cooler, or rear side corner.
- Affix airbill with shipper's and cosignee's addresses to top of cooler; place "This End Up" labels appropriately. Restricted article airbills will be used in shipping medium and high-concentration samples.

Collected and packaged samples will then be shipped to a designated laboratory.

The Field Manager should contact the Sampling Coordinator to confirm sample shipment dates one week in advance for Routine Analytical Services (RAS) sample collection shipments to CLP. The Field Manager will notify the Sampling Coordinator of any last-minute changes in the sampling schedule.

Upon shipment of samples to the Laboratory, the Field Data Coordinator will call the Sampling Coordinator (before 5:30 p.m. central time on the day of shipment or early the following morning). The Sampling Coordinator must be notified by 2:00 p.m. on Friday for shipments to the CLP for Saturday delivery/pick-up. The Sampling Coordinator will be provided with the following information:

1. Case numbers,
2. Name of laboratory(ies),
3. Date of shipment,
4. Carrier, airbill number,
5. Number and matrices of samples shipped, and
6. Information regarding changes and delays pertaining to the activity.

The Sample Identification Record form will be used to record this information. An example of this form is provided as Figure 3-1. A copy must be sent to the Sampling Coordinator with the other sample documents which include copies of the U.S. EPA Sample Data Report and Chain-of-Custody forms.

The U.S. EPA Sample Data Report form for samples being sent to the CLP must also be sent to the Sampling Coordinator. These forms are not sent to the CLP.

3.4 CHAIN-OF-CUSTODY PROCEDURES

Chain-of-custody will be maintained throughout the sample preparation procedure as described in the Southeast Rockford SCOU QAPP Addendum.

SII NAME _____

[illegible]

- 1) ONLY ONE CASE NUMBER PER SAMPLE ID RECORD FORM
- 2) LIST TRAFFIC REPORT (SMO) NUMBERS IN NUMERICAL ORDER
(DO NOT LIST ACCORDING TO CRL NUMBERS)

- All information required on the custody tag, including the signatures of the sampling team leader and a predesignated location description, will be filled out in the field.
- Prior to relinquishing samples for packaging and shipment, one member of the sampling team will transfer all data contained on the custody tags to a chain-of-custody record, which the team leader must sign.
- The individual who prepared the chain-of-custody record will relinquish the samples to the sample handling technician, who will prepare all CLP traffic reports and affix appropriate traffic report labels to the sample containers.
- The technician will package the samples for shipment making sure that all traffic reports, chain-of-custody records and custody seals are cross-referenced and recorded on the Sample Identification Record Form and that all sample documentation paper work is enclosed.
- If samples are stored temporarily prior to shipment, they will be kept cool (4°C) and placed in a secured storage area. Coolers will be sealed and custody seals affixed just prior to shipment.

3.5 DOCUMENTATION

This section outlines the documentation required for all field activities, sample collection, handling and shipment to be conducted during the SCOU.

3.5.1 FIELD LOG BOOKS

Field log books will provide the means of recording pertinent data collected during the performance of RI activities. As such, entries will be described in as much detail as possible so that site personnel can reconstruct a particular situation without reliance on memory.

Field log books will be bound, field survey books. Log books will be assigned to field personnel, but will be stored in the document control center when not in use. Each log book will be identified by the project-specific document number.

The title page of each notebook will contain:

- Person or Organization to whom the book is assigned;
- Book Number;
- Project Name;
- Start Date; and
- End Date.

Entries into the log book will contain a variety of information. At the beginning of each entry, the date, start time, weather, name of all team members present, level of personal protection being used, and the signature of the person making the entry will be recorded. The names of visitors to the site, field sampling or investigation team personnel and the purpose of their visit will be recorded in the field log book. At the end of each day's activity, the log will be closed with the time and signature of the person making the last entry (log-closed line). The log-closed lines and the following log-open lines will be placed so that no unauthorized entries can be made between entries. A typical format is presented in Figure 3-2.

Figure 3-2
TYPICAL FIELD NOTEBOOK ENTRY FORMAT

LOG-OPEN TIME: _____ DATE: _____
SIGNATURE: _____
WEATHER: _____

FIELD PERSONNEL: _____

LEVEL OF PERSONAL PROTECTION: _____

EQUIPMENT (NAME/CONTROL NO.): _____
Calibration Date: _____

Station No./Location Description: _____

Film Roll Number: _____ Photograph Numbers: _____
Station No. _____ (Parameter (Units))

Sampling Equipment: _____

<u>No.</u>	<u>Time</u>	<u>Sample Description</u>	<u>Depth</u>	<u>Number</u>	<u>Volume</u>	<u>Chest No.</u>	<u>Comments</u>
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

Measurements made and samples collected will be recorded. All entries will be made in ink and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark. Wherever a sample is collected or a measurement is made, a detailed description of the location of the station, which may include compass and distance measurements, shall be recorded. The number of the photographs taken of the station with a brief description including and the direction faced will be noted. All equipment used to make measurements will be identified, along with the date of calibration.

The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume and number of containers. Sample location identifiers will be assigned prior to sample collection. Duplicates, which will receive a separate U.S. EPA sample number, will be noted under sample description.

3.5.2 SAMPLE IDENTIFICATION SYSTEM

U.S. EPA SAMPLE NUMBER

Each sample being sent to the CLP for analysis must have a U.S. EPA sample number, regardless of the laboratory to which it is going. This number will be recorded on the chain-of-custody form and the sample field book. The sample number will consist of nine alpha-numeric characters, as follows:

96RS01xyy

The first six characters (96RS01) will generally remain constant for RI sampling, and signify the following:

96	Fiscal year 1996
R	Indicates samples sent by CDM
S	Designates project manager
01	Designates survey number

The last three characters will vary during the sampling survey. The character "x" is a single digit alpha code designating the type of sample:

S	Sample
D	Duplicate sample
R	Blank sample

The character "yy" is a 2-digit (01 through 99) number designating the sample number. After 99 samples have been collected for the survey, the survey number will be changed (characters 5 and 6). For S-type samples, "yy" is used to consecutively number samples taken during this survey. For duplicate (D-type) samples, "yy" is the same as the sample number of which it is a duplicate. For blank (R-type) samples, "yy" is the consecutive number of blank samples taken during this survey.

EXAMPLE U.S. EPA SAMPLE NUMBERS

- 96RS01S01, 96RS01S02, 96RS01S03
Samples No. 01, 02, and 03 of Dewar's Survey No. 1.

- 96RS01D02
Duplicate sample of Sample No. S02.
- 96RS01R01, 96RS01R02
Blank samples No. 01 and 02.

The U.S. EPA sample number(s) will be recorded in the field log book and on all other paperwork and labels and will be cross-referenced to chain-of-custody and shipping documents. A description of the sample location will be entered into the field log book, including compass directions and distances from reference points, if applicable.

SAMPLE LOCATION IDENTIFICATION

Each soil, sediment, soil gas and surface water sample will also be assigned a sample location ID in addition to the U.S. EPA number. The first two letters of the sample location ID denotes the sample matrix. The number portion of the location ID will correspond to the sampling location designations. Sample matrices will be recorded using the following code:

<u>SAMPLE MATRIX</u>	<u>CODE</u>
Surface Water	SW
Sediment	SD
Soil (borehole)	SB
Soil Gas	SG
Soil (Geoprobe)	GP
Soil (Surface)	SS

Subsurface soil samples collected during the SCOU will have up to seven alphanumeric characters. The first two letters will be the sample code. The next one to two numbers will be the source area identifier. The next one to three numbers will correspond to the soil boring or geoprobe location within the source area. Soil borings or geoprobes will have a

one or two-digit designation. The letter suffix will document what depth the sample was collected from, with the letter "A" will representing a surface or near-surface sample, "B" a sample from the second depth interval, "C" the third sample, etc.

An example of a soil sample collected from a soil boring where no well is to be installed is as follows:

SB-4-16D

This identifier denotes a soil sample that would have been collected in Area 4 from soil boring SB16 at the fourth sampling interval (for most soil borings, the 7.5 to 10-foot sample). In general, subsurface soil samples will be collected at depth intervals of 2.5 feet for deep soil borings.

Sediment and surface water samples will be numbered sequentially beginning with SD01 and SW01, respectively. For all sample matrices a final one-letter suffix in parentheses will be added for duplicate or field blank samples. For instance, SG6-01B(D) would represent a duplicate collected for soil gas sample SG6-01B; the suffix "(R)" would represent a field blank for a soil gas or groundwater sample.

Sample designations will be recorded in the sample field book, on the chain-of-custody forms, the traffic reports, the sample identification record form, and on the sample tags affixed to the sample jars.

3.6 SAMPLE DOCUMENTATION FORMS

Sample documentation forms required by the U.S. EPA are numbered and will be accounted for. In the event that a document is voided, it will not be destroyed; instead, voided sample documents will be saved and returned to the Sample Coordinator. Copies of the multiple-copy forms will accompany samples to the laboratory. The other copies will be sent to the Sampling Coordinator immediately following sampling shipment.

A) Chain-of-Custody Form

- 1) One form per shipping container (cooler) will be used.
- 2) Carrier service will not need to sign form if custody seals remain intact.
- 3) Will be used for all samples.

B) Chain-of-Custody Seals

- 1) Two seals per shipping container will be used to secure the lid and provide evidence that samples have not been tampered with.
- 2) Seals will be covered with clear tape.
- 3) Seal numbers will be recorded on Chain-of-Custody Form.
- 4) Seals will be used for all sample shipping containers.

C) Sample Tags

- 1) Each sample container will have a Sample Tag affixed to it with string or wire.
- 2) Traffic Report number and Case Number will be recorded in "Remarks" section of tag.
- 3) Sample Tag Numbers will be recorded on Chain-of-Custody Forms.

D) CRL Sample Data Report

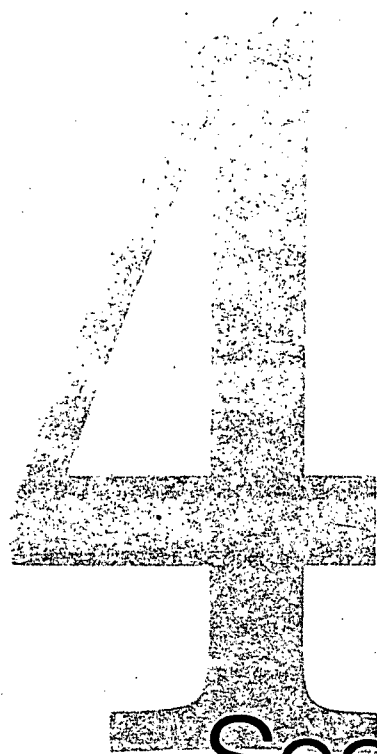
- 1) Will be completed for all CLP samples.
- 2) For samples sent to CLP Laboratories, these forms will be sent to the Sampling Coordinator to be forwarded to the RSCC.
- 3) The forms will be necessary for the U.S. EPA to track the samples and ensure data validation.

E) Sample Identification Record Form

- 1) Will provide a means of recording crucial sample shipping and tracking information.
- 2) This form will be maintained for each sample shipment and forwarded to Sampling Coordinator upon sample shipment.

All paperwork accompanying the samples being shipped to the CLP laboratories will be sealed in a plastic bag that is taped to the inside of the cooler lid. Copies of the chain-of-custody forms, and other paperwork (if possible) will be retained for the field files.

The sample handling technician will maintain lists cross-referencing site sample numbers, custody tag number, analyses to be performed, custody seal number, shippers' airbill numbers, and consigned laboratories in a bound log book using black ink and on the Sample Identification Record Forms. For more details on sampling paperwork, refer to Appendix A.



Section Four

4.0 SAMPLING LOCATIONS AND RATIONALE

4.1 SOURCE AREA INVESTIGATION

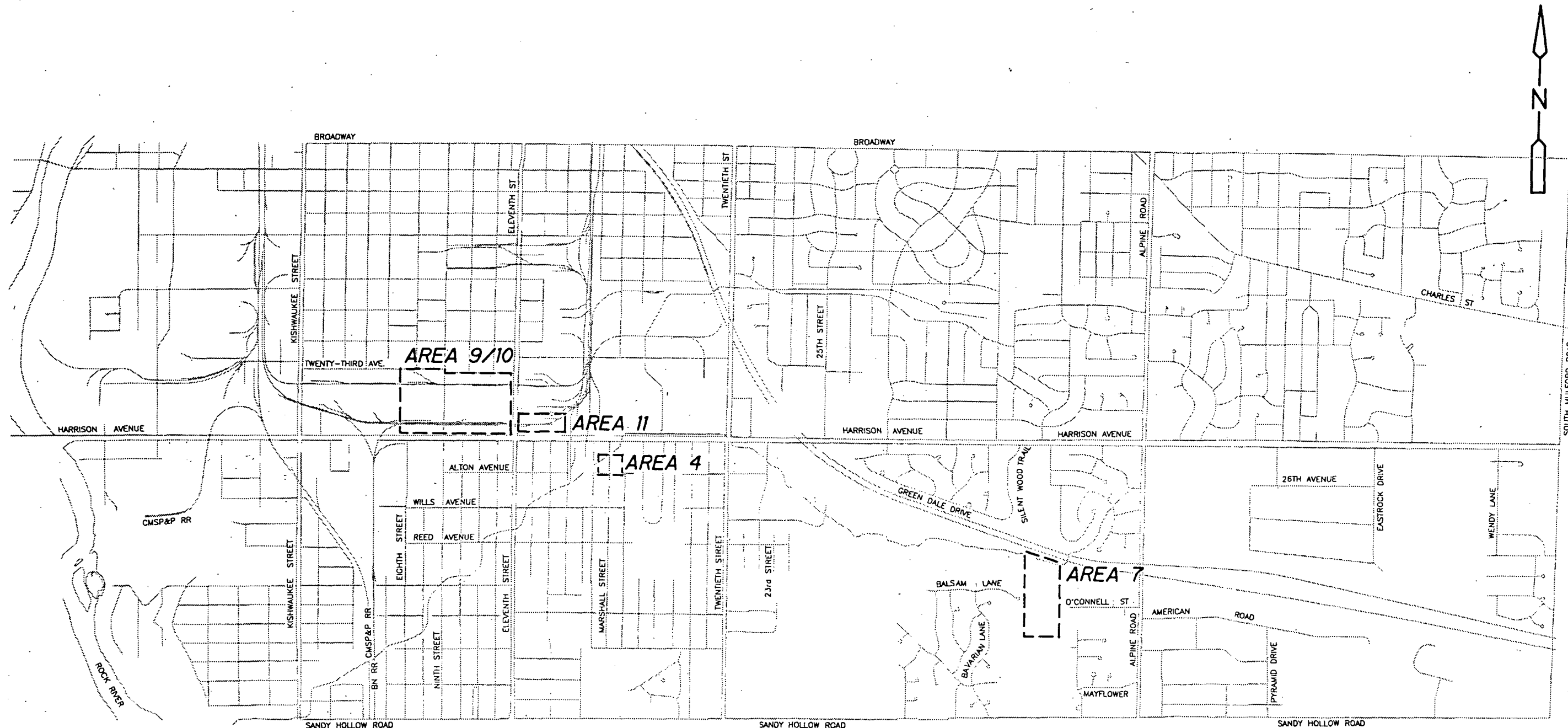
An investigation of Source Areas 4, 7, 9/10, and 11 (see Figure 4-1) will be conducted during the SCOU to further define the extent of contamination in the vadose zone and to evaluate whether dense non-aqueous phase liquid (DNAPL) is present. The field investigation activities to be performed are described in the following subsections. Additional data may be needed to develop site specific PRGs. These data may include parameters such as hydraulic gradient, hydraulic conductivity, estimate of infiltration, contaminant source length, and mixing zone depth.

4.1.1 SOIL GAS SURVEY

A soil gas survey of VOCs will be conducted in Areas 4, 7, 9/10, and 11 prior to soil sampling and the treatability study. These areas were identified from Phase I and II data, aerial photographs, site visits, and information regarding industrial activities. The rationale for each SCOU soil gas survey area is given in Table 4-1 and the locations of the soil gas areas are shown in Figure 4-1.

The proposed soil gas sample locations are shown in Figures 4-2 through 4-5. It is estimated that a total of 298 soil gas locations (including contingency points) will be sampled. Analyses of interest in each area include:

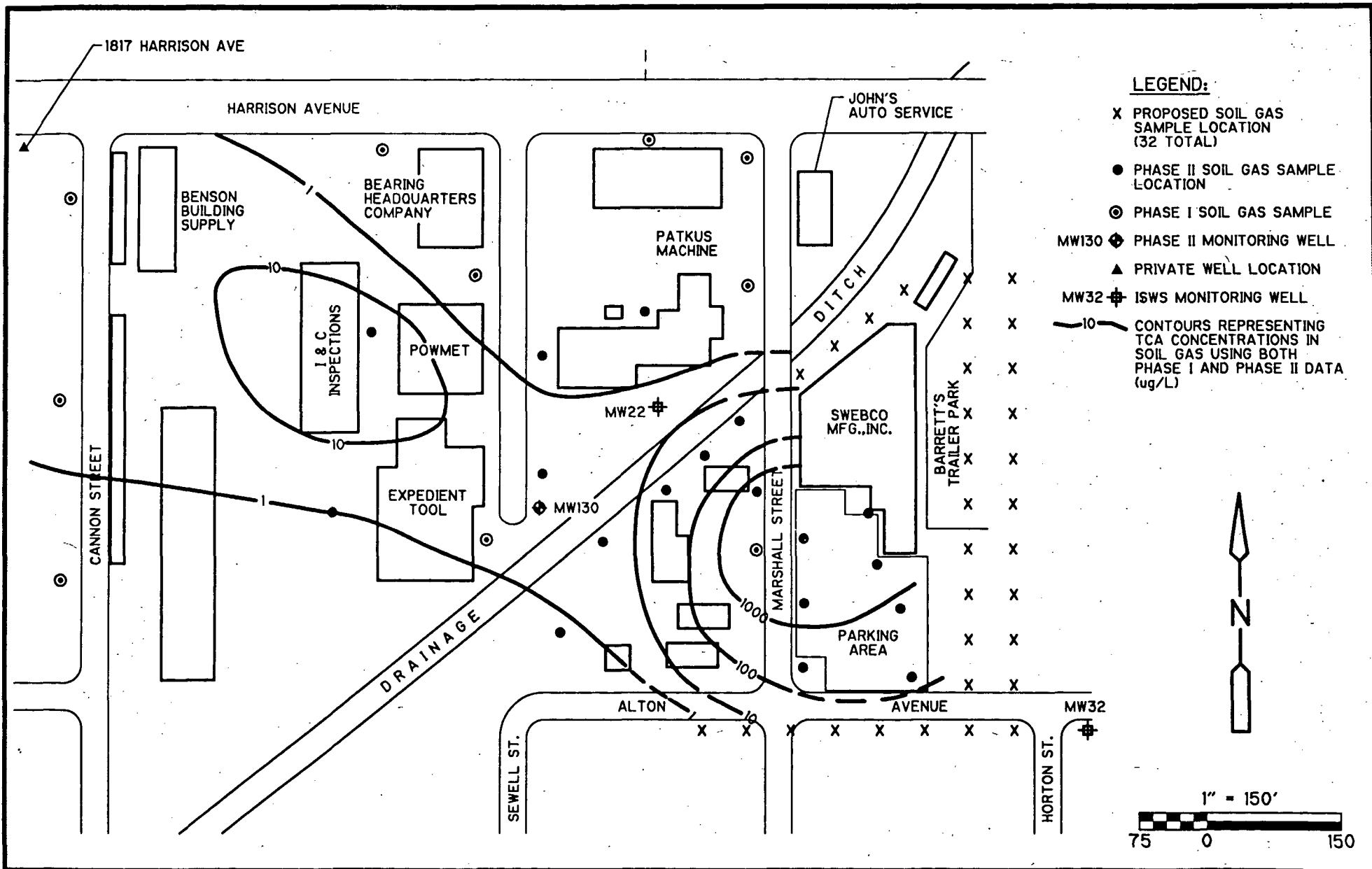
1,1,1-TCA	PCE
1,1-DCA	TCE
	1,2-DCE
	Vinyl Chloride



SOUTHEAST ROCKFORD
SOURCE CONTROL OPERABLE UNIT

SOURCE AREA LOCATIONS

Figure No. 4-1



SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT

AREA 4 SOIL GAS SAMPLE LOCATIONS

CDMenvironmental engineers, scientists,
planners, & management consultants

Figure No. 4-2

TABLE 4-1

**RATIONALE FOR SOIL GAS AND
SOIL BORING WORK FOR SOURCE CONTROL OPERABLE UNIT
SOUTHEAST ROCKFORD**

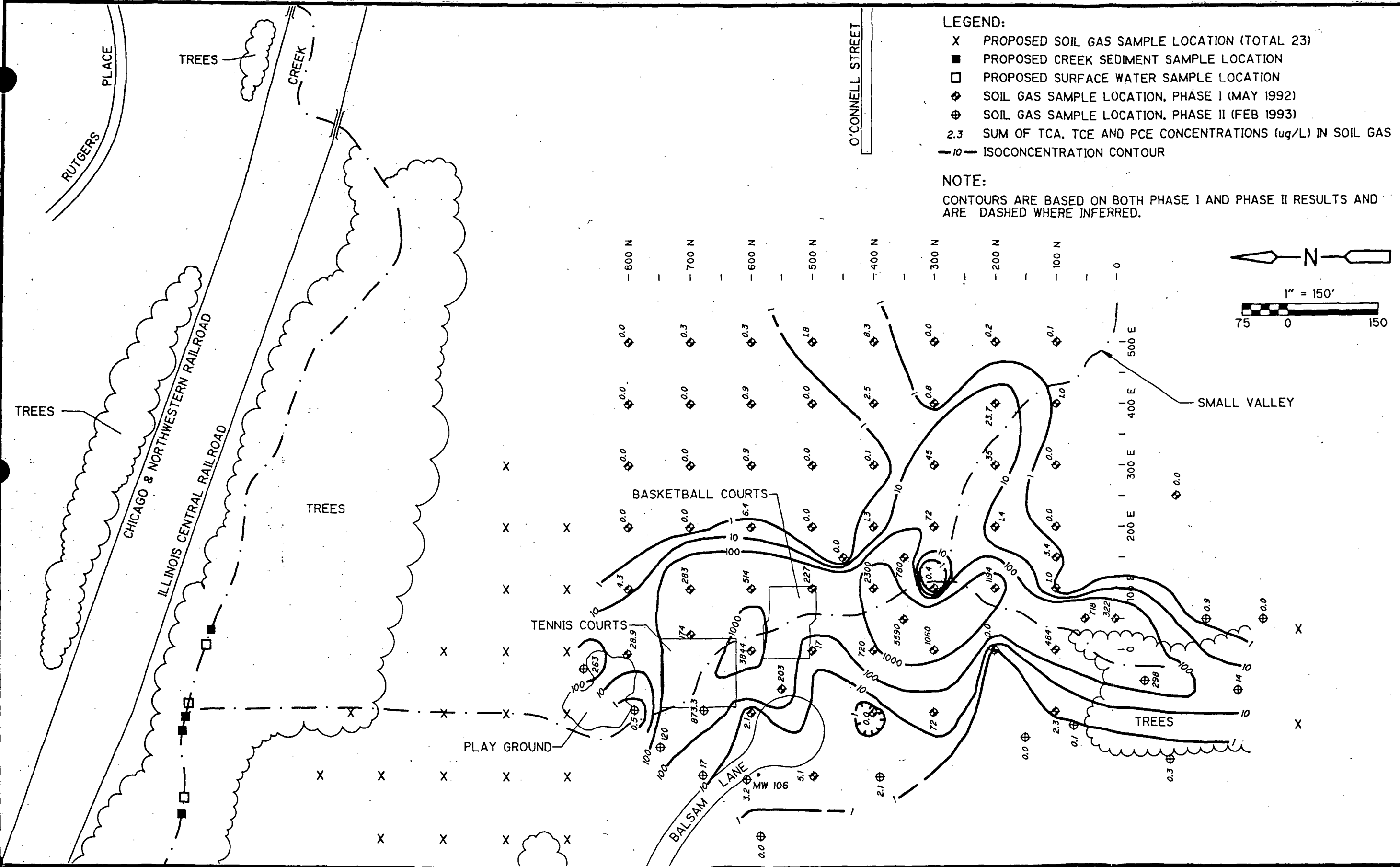
Location	Soil Gas Survey Area	Proposed Soil Gas Survey Points	Proposed Soil Borings (Approximate)	Rationale
Adjacent to Marshall Street and Alton Avenue	4	38 ¹	2	Close off the northeast, east, and south portions of the area.
East end of Balsam Lane	7	27 ²	2	Close off the northern boundary and southwest corner of the area.
Adjacent to 9th Street between Twenty-third and Harrison Avenues	9/10	176 ³	6	Augment existing soil gas data.
Northeast of 11th Street and Harrison Avenue	11	57 ⁴	3	Augment existing soil gas data.

¹ Includes 6 contingency points

² Includes 4 contingency points

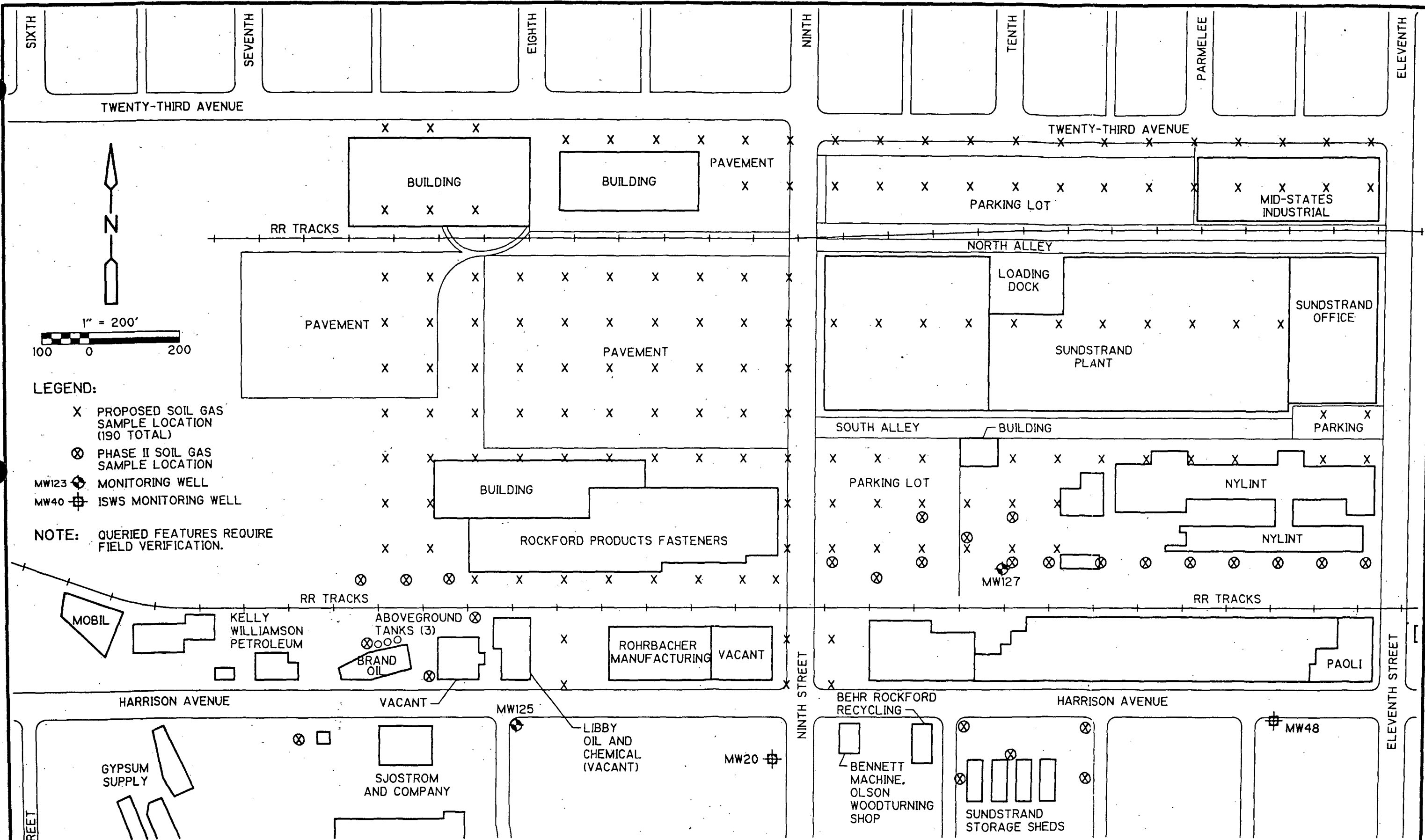
³ Includes 30 contingency points

⁴ Includes 10 contingency points



SOUTHEAST ROCKFORD
SOURCE CONTROL OPERABLE UNIT
AREA 7 SOIL GAS AND CREEK
SAMPLE LOCATIONS

Figure No. 4-3



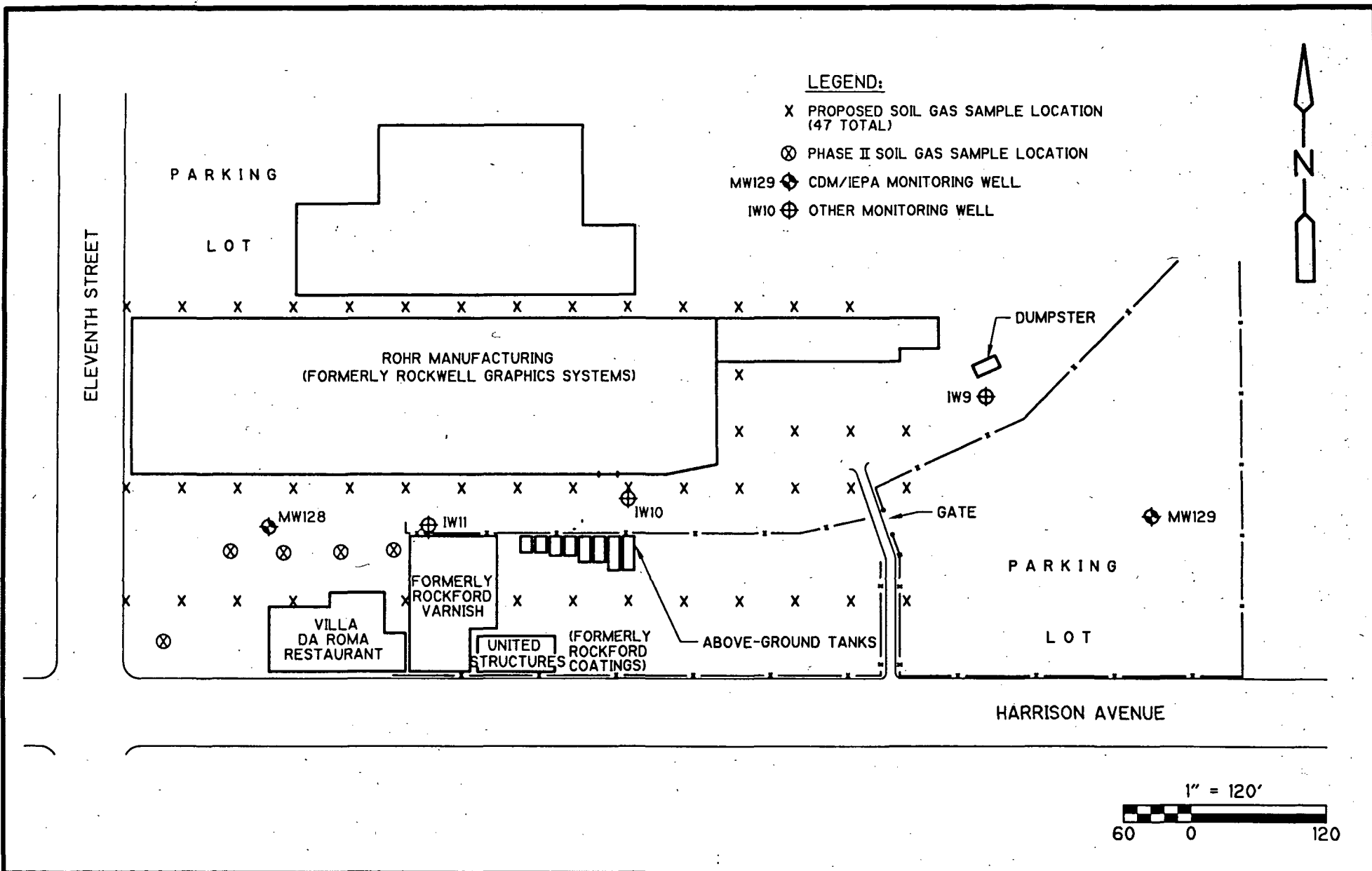
SOUTHEAST ROCKFORD SOURCE CONTROL
OPERABLE UNIT

AREA 9/10 SOIL GAS
SAMPLE LOCATIONS

Figure No. 4-4

CDM

environmental engineers, scientists,
planners, & management consultants



SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT

AREA 11 SOIL GAS SAMPLE LOCATIONS

CDMenvironmental engineers, scientists,
planners, & management consultants

Figure No. 4-5

In addition, in Areas 9/10 and 11 the following compounds will be quantified:

Benzene
Ethylbenzene
Toluene
Xylenes

Soil gas concentrations will be used to define contaminated areas in or near the sources. Soil gas points will be spaced 50 to 100 feet apart in a rectilinear grid pattern. Deviations from this pattern may be necessary to avoid underground utilities or above ground obstacles. A Geoprobe unit will be used to collect soil gas samples. The depth of sample collection will vary with the depth to groundwater. It is anticipated that soil gas samples will be collected at depths between 5 and 30 feet. Soil gas samples will be analyzed shortly after collection using a gas chromatograph located at the site. Results of the soil gas survey will be used to locate Geoprobe soil samples and soil borings.

4.1.2 GEOPROBE SOIL SAMPLES

Soil samples will be collected with a Geoprobe unit from 25 percent of the soil gas sampling locations to confirm the soil gas results and to help delineate the extent of soil contamination. These locations will be selected both to confirm hot spots and to better define areas where soil gas concentrations begin to decrease or are non-detect. The likely distribution will be 50 percent soil gas hot spots and 50 percent low-level and/or non-detect soil gas points. Two soil samples from the vadose zone will be collected at each location and sent to an analytical laboratory for Target Compound List (TCL) volatile organics analysis. An estimated 88 samples will also be analyzed for B/N/A extractables and pesticides/PCBs. These samples will be collected from Area 9/10 where no subsurface analytical data was collected during previous investigations. The first soil sample will be taken from the interval exhibiting large

soil gas concentration, and the second sample will be collected at greater depth than the first where field headspace screening indicates little or no organic vapors. A PID or FID will be used for field screening measurements and the results will be used to locate the positions of the deep soil borings described below.

4.1.3 SOIL BORINGS

Soil borings will be drilled in Areas 4, 7, 9/10, and 11 in areas where soil gas and field headspace measurements indicate high VOC concentrations. The primary objectives of the deep soil borings is to determine whether DNAPL is present near the zones of highest contamination, and to provide detailed information about the stratigraphy for proper placement of the soil vapor extraction wells that will be installed during the treatability study. The borings will be sampled continuously with a split-barrel sampler and advanced until either a contaminated clay unit or bedrock is encountered. In Area 7, bedrock is expected to be approximately 80 feet below grade; bedrock is expected to be more than 100 feet deep in Areas 4, 9/10, and 11. Two borings will be drilled in Areas 4 and 7, three borings in Area 11, and six borings in Area 9/10 because relatively little is known about the subsurface conditions in this area. Boring depth will be 80 feet in each area except in Area 11, where a 60 foot depth (approximately 30 feet below the water table) is anticipated because of the predominance of compounds that are less dense than water. If field screening indicates contamination at a depth of 60 feet at boring locations in Area 11 or at a depth of 80 feet in Areas 4 and 9/10, the borehole will be advanced to bedrock expected to be at a maximum depth of 120 feet.

Soil samples will be visually examined, screened for organic vapors with a PID or FID, and select samples will be physically tested to detect NAPL. Based on visual characteristics and field screening results, one sample from each boring in Areas 4, 7, and 11, will be analyzed

for TCL volatiles organics. Two soil samples from each of the six borings in Area 9/10 will be analyzed for TCL volatiles, Target Analyte List (TAL) metals and cyanide.

4.1.4 RESIDENTIAL AIR SAMPLING

Residential air sampling will be conducted by the Illinois Department of Public Health (IDPH) in selected homes based on the results of the soil gas sampling. CDM will review the data generated and incorporate the results as appropriate in the Technical Memorandum.

4.2 AREA 7 SURFACE WATER AND CREEK SEDIMENT SAMPLING

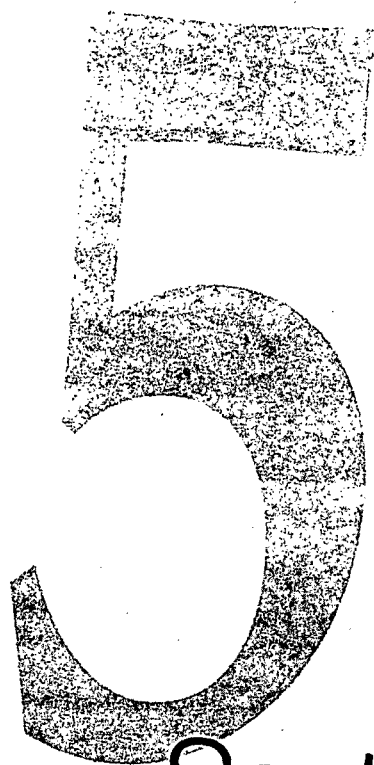
Surface water and sediment from the creek that runs along the northern boundary of Area 7 will be sampled to characterize this portion of the site. One water sample will be collected at the confluence of the creek and the small valley that runs south to north through Area 7 (Figure 4-3), and one water sample will be taken upstream and one downstream of this point. In addition, two sediment samples will be collected at the confluence point, and one sample each from upstream and downstream of this point. The surface water and sediment samples from the creek will be sent to an analytical laboratory for TCL organics analysis.

IEPA/U.S.EPA will use the surface water and sediment data to evaluate the potential for ecological impacts from Area 7 and need for additional sampling in Area 7.

4.3 SURFACE SOIL SAMPLING

A maximum of twenty surface soil samples will be collected during the SCOU. Locations will be determined in the field based on the results of the soil gas sampling. Residential and park areas will be the primary areas targeted for sampling. It is expected that four samples will be collected in Area 7, north of the playground and south of the creek; four samples will be

collected in Area 9/10 in the residential area north of Twenty-Third Avenue and two samples from Area 4, east of the Swebco facility. Ten contingency samples are planned to be distributed between Area 11 and the other three areas based on results of the soil gas. Samples will be analyzed for full RAS Target Compound List Organics and RAS Metals and Cyanide.



Section Five

5.0 SAMPLING EQUIPMENT AND PROCEDURES

5.1 SOIL GAS SURVEY

A soil gas survey of VOCs will be conducted in Areas 4, 7, 9/10, and 11 to define contaminated areas in or near the sources. A total of 323 soil gas sample locations have been identified and are shown on Figures 4-2 through 4-5. Soil gas points will be spaced 50 to 100 feet apart in a rectilinear grid pattern. Deviations from this pattern may be necessary to avoid underground utilities or above ground obstacles.

The soil gas samples will be collected using the Post Run Tubing (PRT) system that utilizes a hollow metal probe driven into the ground with an expendable point using the Geoprobe system. The leading hollow probe rod is fitted with an expendable point holder and an expendable point is then driven to the desired sampling interval. The expendable point holder has a left-hand female threaded opening that accepts an aluminum left-hand threaded tubing adaptor. A required length of 1/4-inch O.D. polyethylene tubing is fitted to the hollow tubing adaptor. The tubing and adaptor are lowered down inside of the probe rods and threaded into the expendable point holder. To assure an air tight seal is maintained, a rubber o-ring is placed between the tubing adaptor and the expendable point holder. As the probe rod string is pulled up a few inches it exposes a cavity of soil from which a representative soil gas sample can be collected. The tubing and cavity are purged of three volumes using a vacuum pump at the surface. A vacuum chamber fitted with a pre-sterilized 0.5 liter Tedlar bag is connected to the sample tubing and evacuated generating negative pressure inside the chamber allowing the bag to fill with soil gas. Soil gas samples should never contact potentially sorbing materials. Soil gas samples will be collected at depths between 5 and 30 feet, depending on the depth to groundwater. The Tedlar bags will be sub-sampled by a sterilized glass syringe to accommodate analytical volume requirements. The sample will then be injected into the

gas chromatograph for analysis. More than two injections may be necessary where there are multiple contaminants that required different sample sizes for chromatograph analysis.

After the soil gas sample has been collected, the expendable point remains in the soil and the probe rods are removed from the ground. The hole will then be sealed with granular bentonite, and an asphalt or concrete patch will be used to restore the area to pre-investigation activities, if necessary. Remote sampling techniques may be used if field conditions preclude use of the truck mounted equipment. Additional information on sampling equipment and procedures for the soil gas survey is provided in SG-1 contained in Appendix B.

5.2 GEOPROBE SOIL SAMPLES

In order to confirm hot spots and better define areas where soil gas concentrations begin to decrease, approximately 25% of the soil gas sampling locations will have two soil samples collected (75 locations, 150 soil samples) from the vadose zone. The soil samples will be collected from an average depth of 20 feet using the Geoprobe system. The first soil sample will be taken from the interval exhibiting large soil gas concentration, and the second sample will be collected at greater depth than the first where field headspace screening indicates little or no organic vapors. A PID or FID will be used for field screening measurements as described in Section 5.3. Acetate sleeves will be used in the soil collection tool to contain the soil samples. After the soil samples have been collected, the acetate sleeve will be cut and the soil sample will be transferred to an unpreserved, clean, USEPA CLP approved containers for analysis by a CLP laboratory. VOC samples will be grab samples, selected visually or by screening, and placed immediately into 120 ml vials.

After the soil samples have been collected and the probe removed from the ground, the remaining hole will be backfilled with granular bentonite to six inches below grade, and an asphalt or concrete patch will be used to restore the area to pre-investigation conditions, if necessary. If field conditions

dictate, samples may be collected with a hand auger to depths not to exceed 8 feet. Additional information on sampling equipment and procedures for geoprobe soil sampling is provided in SS-1 contained in Appendix B.

5.3 SOIL BORING SAMPLES

A total of 13 soil borings will be drilled in Areas 4, 7, 9/10, and 11 in areas where soil gas and field headspace measurements indicate high VOC concentrations in order to determine whether DNAPL is present near the zones of highest contamination and to provide detailed information about the stratigraphy for proper placement of the soil vapor extraction wells during the treatability study. The borings will be advanced by means of hollow stem augers, which will serve as a temporary casing for the borehole. The borings will be sampled continuously with a split-barrel sampler and advanced until either a contaminated clay unit or bedrock is encountered. Upon boring termination, the borehole will be incrementally grouted from the bottom to the surface as the augers are withdrawn. The grout will consist of a high solid bentonite clay that is nontoxic and nonorganic.

Subsurface soil sample from the deep boring will be collected in accordance with ASTM standards for analytical and lithologic purposes. These samples will be visually examined and screened in the field for VOCs with a PID or FID. Field screening will consist of placing a small amount (6-7 grams) of a representative subsurface soil sample into a 4 oz. laboratory jar or a plastic bag. The jar mouth will then be covered with aluminum foil (or the bag closed) and allowed to sit for approximately one-half hour at a temperature 60 degrees F or greater. The organic vapor content inside the sample jar will then be determined by piercing the aluminum foil with instrument probe and noting the organic vapor level. Levels will be recorded in the sample field book. Procedures for the field organic vapor detection instrument are provided in Appendix C. The subsurface sample in each deep soil boring with the highest screening concentration of VOCs will be submitted for TCL

volatile organics analysis. If elevated VOCs are not detected in a particular boring the sample nearest the water table will be submitted for laboratory analysis. In addition, two subsurface soil samples from each of the four borings in Area 9/10 will be submitted for TAL inorganics analysis.

All subsurface analytical soil samples will be collected from decontaminated split-spoon samplers provided by the subcontracted drilling firm during drilling activities. General soil sampling procedures are discussed in Appendix D. Sample collection procedures are summarized as follows:

- The split-spoon sampler will be placed on a decontaminated stainless steel tray and opened following recovery of the sampler from the borehole;
- Soil samples will be transferred from the split-spoon sampler into laboratory-sterilized sample jars by CDM field samplers wearing surgical gloves using decontaminated stainless steel spatulas or stainless steel scoops (sample containers are listed in Table 3-1;
- VOC samples will be grab samples, selected visually or by screening, and placed immediately into 120 ml vials;
- The sample bottle lids will be securely tightened to the sample jars;
- The exterior of the filled sample jars will be decontaminated as described in Section 6;
- Samples collected for field organic vapor monitoring will be screened and values will be recorded in the sample field book.

- The lithologic, visual and olfactory characteristics, organic vapor readings as well as the sample depth and identification designation (as described in subsection 3.5.2) will be recorded in the field book; and
- The sample jars will be sealed in a zip-lock bag and immediately placed in an iced cooler

Lithologic samples will be collected for the purpose of determining and describing the geologic materials present at depth. The lithologic samples will be visually inspected and classified by CDM's onsite geologist. In practice, all subsurface soil samples from the borings will be used for lithologic purposes. As previously mentioned, subsurface soil samples will be collected continuously in the deep borings. The lithologic samples will be used to gain a clear understanding of the nature of the materials present at depth, to aid description of geologic materials penetrated by the boreholes, to assist in stratigraphic correlation of clay deposits, and to define preferential pathways of groundwater (and contaminant) migration.

Selected subsurface soil samples, based on visual characteristics and field screening results, will undergo physical testing to detect non-aqueous phase liquid (NAPL) using the hydrophobic soil-water shake test¹. The procedure for the visual detection of NAPL in soil using the hydrophobic soil-water shake test is as follow:

1. A soil sample is collected and put into a Ziploc polyethylene bag for storage.
2. Three minutes after the sample is containerized in the bag, the probe tip of a Photo-Ionization Detector is inserted into the bag to determine if volatile organics are present in

¹DNAPL Site Evaluation, EPA/600/R-93/022, February, 1993 (USEPA, 1993)

the headspace of the sample.

3. After the headspace reading has been collected, a visual examination of the sample is made to determine if free form NAPL is present in the sample.
4. Upon completion of the visual examination, 20 cubic centimeters of sample is transferred from the polyethylene bag to a 50 milliliter polyethylene test tube using a stainless steel spoon. Twenty milliliters of distilled water is then added to the soil in the test tube and shaken by hand for approximately 10 seconds to create a soil-water suspension.
5. After the soil-water suspension has been created, another visual check for NAPL presence is made by looking through the test tube walls and at the fluid surface.
6. Upon completion of the visual test, approximately two milligrams (an amount that would rest on the edge of a toothpick) of Sudan IV, a nonvolatile hydrophobic dye; is placed into the test tube with the soil-water suspension. It is important during this step to be cautious when using the Sudan IV dye, as it is an irritant, and possible mutagen which should not come in contact with skin or eyes.
7. After the dye has been added to the test tube containing the soil-water suspension, the tube is manually shaken for 10 to 30 seconds. When the shaking time has elapsed, a visual inspection of the test tube is made to determine if NAPL is present in the sample. Again it is important to be cautious when shaking the soil-water suspension after the dye has been added.

5.4 SURFACE WATER SAMPLES

Three surface water samples will be collected from the creek that runs along the northern boundary of Area 7 to characterize this portion of the site. One water sample will be collected at the confluence of the creek and the small valley that runs south to north through Area 7 (Figure 4-3), and one water sample will be taken upstream and one downstream of this point. The techniques for sampling are described in SIPM method #562001 contained in Appendix D. Field measurements of pH, conductivity and temperature will be collected. The surface water samples will be laboratory-analyzed for TCL organics.

5.5 SEDIMENT SAMPLES

Four sediment samples will be collected. The sediment sampling locations will correspond to the surface water sampling locations, except that two sediment samples instead of one sample will be collected at the confluence point. The samples will be collected using a sediment core sampler and will consist of the top 10 inches of material at the sampling location. Three samples will be selected for a composite sample at each location. The sample core will be emptied, mixed in a stainless steel tray and transferred into the appropriate sample containers using stainless steel spatulas. Decontamination of sampling equipment will proceed according to the standard decontamination protocol presented in Table 6-1, Section 6.2.

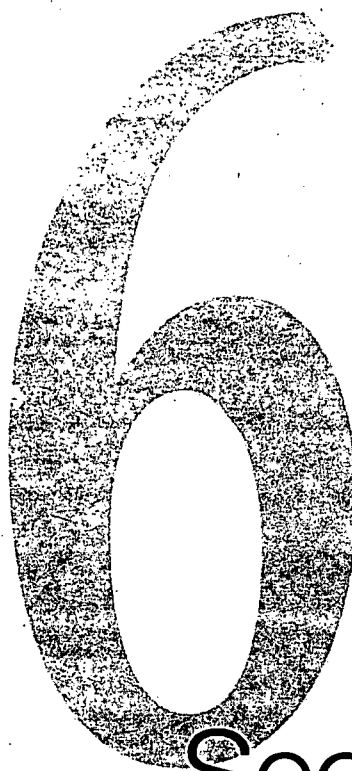
The sediment samples will be shipped to the laboratory for TCL organic analysis. Sediment sampling procedures are described in the SIPM method 5614005 contained in Appendix D.

5.6 SURFACE SOIL SAMPLES

A maximum of twenty surface soil samples will be collected at locations determined in the field

based on the results of the soil gas sampling. The samples will be collected using a decontaminated stainless steel spatula or scoop from 0 to 6 inches. These samples will be visually examined and screened in the field for VOCs with a PID or FID using the procedures described in Section 5.3. Three samples will be selected for a composite sample at each location. The soil samples will be placed in a stainless steel bowl for mixing and transferred into laboratory-sterilized sample jars using stainless steel spatulas. VOC samples will be grab samples, selected visually or by screening, and placed immediately into 120 ml vials. Decontamination of sampling equipment will proceed according to the standard decontamination protocol presented in Table 6-1, Section 6.2

The soil samples will be shipped to the laboratory for TCL organics and TAL inorganics analysis. General soil sampling procedures are discussed in Appendix D.



Section Six

6.0 DECONTAMINATION PROCEDURES

Procedures to be followed to decontaminate equipment and personnel are fully described in the Southeast Rockford Health and Safety Plan. The procedures are summarized below and are further detailed in Appendix E.

6.1 PERSONNEL DECONTAMINATION

Personnel decontamination stations will be set up at the edge of each study area. Personnel will become thoroughly familiar with the decontamination procedure before work begins in exclusion zones. The exclusion zone will be defined as an area 25 feet surrounding the drilling, soil gas collection points, and groundwater sample collection points. The decontamination procedure is as follows:

- Place equipment and/or samples in segregated equipment drop-areas.
- Remove disposable outer booties (when used).
- Remove chemical resistant outer gloves (when used).
- Remove hard hat, goggles-safety glasses-face shield (when used).
- Remove inner disposable gloves.
- Wash hands and face with water and hand soap.

6.2 EQUIPMENT DECONTAMINATION

Decontamination of large equipment (vehicles, backhoes, drill rigs and associated equipment) will be performed at a portable cleaning station (decontamination pad). The decontamination pad will be approximately 20 ft. larger and 20 ft. wider than the largest drilling vehicle used for site work. The station will consist of a seamless heavy gauge (30 mil or greater) plastic

sheet, or other material of equal quality, which shall be laid over the ground surface. As necessary, a base of sand will be placed on the ground to prevent damage to the membrane liner from sharp protrusions in the ground. The sides of the sheet will be raised by tacking them to a 2-inch x 4-inch (common two-by-four) length of wood, thereby creating a lip along the perimeter. The front and rear of the sheet will be placed over a small, smooth soil berm to permit the drilling equipment to drive onto and off of the plastic sheet.

All equipment will be steam-cleaned at the decontamination pad prior to initiation of work at the site. This includes drill rigs, augers, probe rods, split-spoon samplers, tools, and any other equipment brought on-site. Between samples, the sampler will be decontaminated. Between boreholes all augers, probe rods, samplers, and other equipment used in the boreholes will be decontaminated. Upon completion of drilling activities, all equipment will be decontaminated before leaving the site.

All soil and sediment sampling equipment will be decontaminated prior to use, and all reusable non-dedicated equipment (scoops, buckets, core samplers, dredges, bottle sampler) will be decontaminated between samples, and before removal from the site. The procedure is given in Table 6-1.

6.3 SAMPLE BOTTLE DECONTAMINATION

Sample bottles for shipment to the laboratories will be decontaminated by immersing the bottle up to the neck in soap (Alconox or equivalent) and water solution and then rinsing with potable or distilled water. Solvents will not be used to wash sample bottles.

TABLE 6-1
STANDARD DECONTAMINATION PROTOCOL FOR SAMPLING EQUIPMENT

- STEP 1 -- Scrub equipment thoroughly with soft-bristled brushes in a low-sudsing detergent solution.
- STEP 2 -- Rinse equipment with tap water by submerging and/or spraying.
- STEP 3 -- Rinse equipment with distilled water by spraying until dripping.
- STEP 4 -- Place equipment on plastic or aluminum foil and allow to air dry for five to ten minutes.
- STEP 5 -- Wrap equipment in plastic or aluminum foil for handling and/or storage until next use.

NOTE: In order to avoid analytical problems caused by solvent use in decontamination, solvents will not be used for decontamination. Only distilled water shall be used for rinsing equipment. An exception will be made if upon visual observation or high organic vapor readings it is determined that a zone of highly contaminated material is encountered. In such an event, isopropyl alcohol will be used before step 1 above.

6.4 STORAGE AND DISPOSAL OF SCOU-GENERATED WASTES

The sampling and drilling activities are expected to generate solid and liquid "waste." The activities, the anticipated type and the planned handling of the wastes are summarized below.

- Soil boring and geoprobe installation: SOLID: drilling cuttings and excess soil/cuttings collected and retained in drums for future disposal as directed by the IEPA; LIQUIDS: none

All disposable protective clothing, disposable sampling equipment and liquids generated by decontamination procedures will be contained in 55-gallon drums and stored in a secure area designated by IEPA. Disposal of these materials will be as directed by IEPA.

Solids and liquids will be contained separately. Ultimate disposal of SCOU-generated wastes will proceed as directed by IEPA.



Section Seven

7.0 FIELD QUALITY CONTROL PROCEDURES

To ensure the level of data quality required for Superfund Remedial Investigations, the following Quality Control (QC) procedures will be performed. QC sample requirements are summarized in Table 1-1.

7.1 SOIL AND SURFACE WATER QC SAMPLES

Field Duplicates

One duplicate soil/sediment sample will be collected for every 20 samples (or portion thereof) collected in the field. One duplicate surface water sample will be collected for every 10 samples (or portion thereof collected in the field). Duplicate samples will be collected at the same sample volume and in the same type of container as other samples. Duplicate sample quantities and collection shall apply to both soil and water samples.

Field Blanks

One field blank water sample will be prepared for every ten surface water samples collected. Field blanks will be prepared by filling water sample bottles with reagent-grade distilled water from the sampling device (if possible), at the same volume as the surface water samples. Sample bottles for all parameters will be prepared. These samples will be prepared in close proximity to an actual sample location. This location will be recorded in the sample field log book.

Trip Blanks

A trip blank for volatile organic analysis (VOA) will be included in each sample shipment for volatile organic analysis. The trip blank will consist of four 40-ml VOA vials filled with reagent-grade distilled water. The trip blank will be prepared in the office or laboratory, transported to the field, and shipped with the other samples to the CLP without being opened. The trip blank will be documented on a traffic report form for shipment to the Contract Laboratory Program.

Matrix Spike and Matrix Spike Duplicates

All samples designated as MS/MSD samples will be collected as specified in the USEPA Region V Sample Handling Manual. Matrix spike samples will be denoted by the sample number followed by an -MSD suffix on sample tags, chain-of-custody forms, and other appropriate sample paperwork.

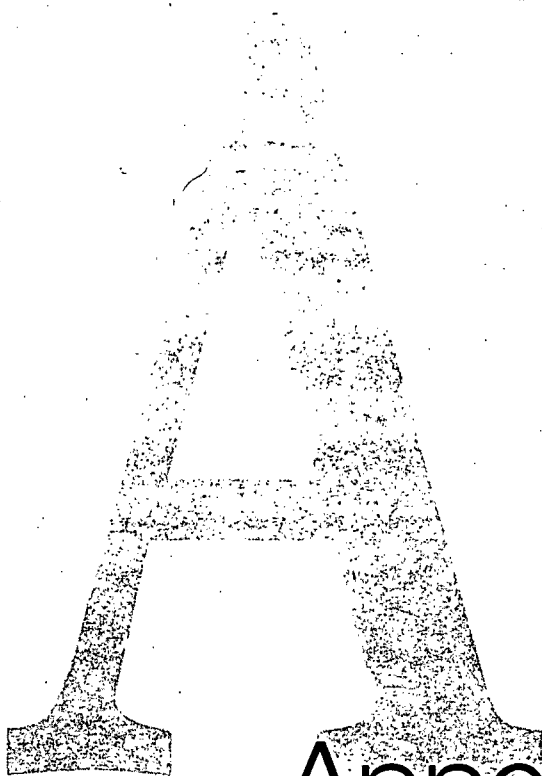
Water samples for semivolatile (extractables and pesticides/PCBs) MS/MSD analysis will be collected at double volume at a frequency of one per twenty samples.

7.2 SOIL GAS OC SAMPLES

Field Blanks

Field blanks for soil gas samples will include system blanks and rinseate blanks. One system blank will be run each day prior to sampling to check the sampling apparatus for contamination. Rinseate blanks will be collected from the soil sampling equipment after every five samples and at the beginning of each day, if necessary. Further details on system

and rinseate blanks are provided in Section 6.0 SOP FOR SOIL GAS SAMPLE COLLECTION
AND ANALYSIS in Appendix A of the QAPP.



Appendix A

APPENDIX A

U.S. EPA REGION V SAMPLE HANDLING MANUAL

SF SAMPLE DOCUMENTATION REQUIREMENTS

Contract Laboratory Program

Traffic Reports	C-1 through C-12
Chain of Custody Form	C-13 through C-15
SAS Packing List	C-16 through C-17
Sample Tags	C-18 through C-19
CRL Sample Data Report	C-20 through C-22
Chain of Custody Seals	C-19
Dioxin Shipment Record	C-23 through C-24

Central Regional Laboratory

Chain of Custody Form	C-13 through C-16
EPA CRL Analysis Request Form	C-25 through C-26
Sample Tags	C-18 through C-19
Chain of Custody Seals	C-19

SAS PACKING LIST

1. Insert assigned SAS case number.
2. Insert EPA region number, V and your contractor company name.
3. Insert sample team leader's name.
4. Insert sample team leader's office telephone number (do not use field office telephone number).
5. Insert date sample was taken.
6. Indicate date of shipment.
7. Insert the site name only if it does not copy onto the lab's copy (see note below). Also list the site/spill ID.
8. Insert laboratory name and address, and the carrier name and airbill number.
9. Indicate name of laboratory contact.
10. List SAS sample numbers, which should include SAS number (i.e., if the SAS # is 2743E, the samples would be numbered as 2743E-01, 2743E-02, etc.)
11. Specify sample matrix, concentration, tag number, and analysis to be performed (e.g., low concentration soil sample for PCB analysis, tag number 5-48246).
Indicate whether shipment is complete at the bottom of the form.
12. Leave BLANK - laboratory use only.

NOTE: The site name should not be written on this form while all copies are attached if there is no protection to prevent the site name from appearing on the lab's copies. The CLP laboratory should not have this information. Therefore, either use a site code or separate the copies and only write the site name on the Regional and SMO copies of this form, if necessary.

THIS IS A FOUR COPY FORM:

The top copy should be sent to SMO within a day or two of shipping samples.

The second (yellow) copy should be sent with other paperwork for a site to the Region V RSCC.

The bottom two copies (pink and gold) get sent to the CLP laboratories with the samples.

U.S. ENVIRONMENTAL PROTECTION AGENCY
 CLP Sample Management Office
 P.O. Box 818 - Alexandria, Virginia 22313
 Phone: 703/557-2490 - FTS/557-2490

① SAS Number

SPECIAL ANALYTICAL SERVICE
 PACKING LIST

Sampling Office: ②	Sampling Date(s): ⑤	Ship To: ⑧	For Lab Use Only
Sampling Contact: ③ (name)	Date Shipped: ⑥		Date Samples Rec'd:
④ (phone)	Site Name/Code: ⑦	Attn: ⑨	Received By:

Sample Numbers	Sample Description Le., Analysis, Matrix, Concentration	Sample Condition on Receipt at Lab
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10. ⑩	⑪	⑫
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		

For Lab Use Only



White - SMO Copy, Yellow - Region Copy, Pink - Lab Copy for return to SMO, Gold - Lab Copy

SAMPLE TAG

1. Enter your project number for the site, which may be the first six digits of the CRL log number (see page C-21).
2. Enter the sampling station code, i.e., MW1, BLX, SS1, etc.
3. Enter date of sampling.
4. Enter time of sampling (military time only).
5. Specify "grab" or "composite" sample with an "X".
6. Insert station location. If the sample is a field blank or if to be used for the spike or duplicate analysis, notate here.
7. Obtain signature of sample team leader.
8. Indicate presence of preservative with an "X".
9. Specify analytes for analysis with an "X".
- 10a. Indicate traffic report number (i.e., EV846 or MEX013) for that sample if the samples are being shipped to the CLP. If the samples are going to the CRL, list the CRL log number.
- 10b. Indicate the case number.
11. Leave BLANK (for laboratory use only).
12. Enter any desired analyses not listed on the tag provided (e.g., PCB's, ammonia, sulfide, etc.) and mark the box with an "X".

NOTE: Each sample container should have a separate tag.
All field blanks should be designated as such on the sample tags, either in the 'Remarks' field (10a and 10b) or in the 'Station Location' field (6).

Sample Tag

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 5 230 South Dearborn Street Chicago, Illinois 60604 							
Project Code (1)	Station No. (2)	Month/Day/Year (3)	Time (4)	Dry Pond <input type="checkbox"/> Camp <input type="checkbox"/>	(5)	(7)	Preservative: Yes <input type="checkbox"/> No <input type="checkbox"/>
							(8)
Station Location (6)				ANALYSES			(9)
				BOD Ammonia Solids (man from dis) COD, TOC, Nutrients Phenolics Mercury Metals Cyanide Oil and Grease Organics GC/MS Priority Pollutants Volatile Organics Pesticides Mutagenicity Bacteriology			(12)
Remarks: (10a) (10b)							
Tag No. 5- 32261				Lab Sample No. (11)			

Front

Back

Each cooler should have 2 CDC seals applied.

U.S. ENVIRONMENTAL PROTECTION AGENCY REGION 5 OFFICIAL SEAL No. 13400

Chain of Custody Seal

INTRODUCTION AND INSTRUCTIONS FOR USE OF MULTI-SAMPLE ORGANIC AND INORGANIC TRAFFIC REPORTS

A. Introduction: Samples and Sample Numbers

Contract Laboratory Program (CLP) multi-sample Traffic Reports (TRs) can document up to twenty samples shipped to one CLP laboratory under one Case Number. The TRs must be used for every shipment of RAS samples to a CLP laboratory.

The CLP's definition of "samples" is based on the RAS analytical program: (1) organic, (2) VOA only (3) inorganic.

A CLP sample is one matrix — water or soil — and consists of all the sample aliquots from a sample station location for analysis in one RAS analytical program. The CLP assigns a unique Sample No. to each such set of aliquots sent to one CLP laboratory. The unique Sample Numbers are printed on the adhesive labels. The samplers must accurately transfer this critical Sample Number to the TR.

Organic Sample Numbers are in the format XX123, and have six labels per strip: four for extractables, and two for VOAs (see attachment). CAUTION: The organic sample labels provide two options for each Sample No. — labels for water samples and labels for soil samples. USE ONLY ONE OF THE TWO OPTIONS. An individual sample will be analyzed as EITHER a water or a soil, but never both. DESTROY THE UNUSED LABELS to prevent duplication of Sample Numbers.

Inorganic Sample Numbers are in the format MXX123 and have seven labels per strip: two for Total Metals, two for Cyanide and three extra (see attachment). Remember that the unique Sample No. must only be used once so DESTROY THE EXTRA LABELS.

Use only the labels provided to the Region in which you are sampling. CLP Sample Numbers are an alphanumeric code specific to each Region:

Letter Code	Region	Letter Code	Region
<u>Organic</u>	<u>Inorganic</u>	<u>Organic</u>	<u>Inorganic</u>
A, MA	I	F, MF	VI
B, MB	II	G, MG	VII
C, MC	III	H, MH	VIII
D, MD	IV	Y, MY	IX
E, ME	V	J, MJ	X

REMEMBER:

- o TRs must be used for each Case No. with every shipment of samples to each CLP laboratory.
- o Organic samples, "VOA Only" samples, and inorganic samples are assigned separate, unique Sample Numbers. Each consists of all the sample aliquots from a sample station location.
- o A CLP RAS sample will be analyzed as either a water or a soil sample.
- o Prevent accidental duplication of Sample Numbers by destroying unused labels.
- o Use only the Sample Numbers specific to your Region.

B. Completing the Form - Case Documentation

Enter the Case No. and SAS No. (if applicable) at the top right of the form.
Complete the boxes in the header:

Box No. 1:

Type of Activity:

If sampling is under Superfund, circle the code which describes the task of the sampling mission:

PA -	Preliminary Assessment
SI -	Site Investigation
ESI -	Expanded Site Investigation
RIFS -	Remedial Investigation Feasibility Study
RD -	Remedial Design
RA -	Remedial Action
ER -	Emergency Response (Removal)
NPLD -	National Priorities List Delete
O + M -	Operations and Maintenance

If sampling is not under the Superfund program, enter the name of program, e.g., RCRA. Enter the site name, the city, state, and Site Spill ID (provided by Region) in the designated spaces.

Box No. 2:

Regional Information

Enter the Region number, the name of your sampling company, and your name in the designated spaces.

Box No. 3:

Ship To:

Enter the name of the CLP laboratory and its full address in the box. Enter the name of the sample custodian or CLP contact in the box provided.

Enter the beginning and ending sampling dates in the designated spaces.

Enter the date shipped, the carrier code (e.g., F = Federal Express, P = Parolator, etc.) and the airbill number in the appropriate spaces.

C. Completing the Form - Sample Documentation

Carefully transcribe the CLP Sample No. from the printed sample labels on the TR in the space provided.

Complete columns A through E to describe the sample:

Column A, Sample Description:

Enter the appropriate sample description code from Box 6. NOTE: Describe RINSATES or BLANKS as #3 "Leachate" in Column A. Write the word "Rinsate" or "Blank" in Column D, the Special Handling section, or in Column E, the Station Location section. Note: Item #3 "Oil" and Item #7 "Waste" are for RAS PLUS SAS projects only. Do not ship oily samples or waste without making prior arrangements with SMO.

Column B, Concentration:

Organic - If sample is low or medium concentration, enter "L". When shipping RAS plus SAS high concentration samples (previously arranged with SMO), enter "H".

Inorganic - Enter "L" for low concentration, "M" for medium concentration, and "H" for high concentration (under previous RAS plus SAS arrangement).
REMINDER: Ship medium and high concentration organic and inorganic samples in metal cans.

Column C: RAS Analysis:

Check the analytical fractions requested on each sample.

Column D: Special Handling:

Use this space to relevant specify any special handling requirements. Rinse or blank samples should be identified as such in this space. When shipping RAS plus SAS samples you may code SAS parameters in the blank space (e.g., A = sulfate, B = Cl, etc.) and enter the codes in this column.

Column E: Station Location:

Enter the station location in the space provided.

IMPORTANT: SAMPLERS MUST INDICATE ON EACH TRAFFIC REPORT WHETHER SAMPLING IS COMPLETE OR IF MORE SAMPLES WILL BE SHIPPED UNDER THE SAME CASE NUMBER. THIS STATEMENT CAN BE WRITTEN ANYWHERE ON THE FORM THAT DOES NOT OBSCURE NECESSARY INFORMATION, AND CAN BE AS SIMPLE A STATEMENT AS "SHIPMENT COMPLETE FOR THIS CASE" OR "MORE SAMPLES TO COME UNDER THIS CASE."



United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 810 Alexandria, VA 22313
703-557-2400 FTS 557-2400

Organic Traffic Report
& Chain of Custody Record
(For Organic CLP Analysis)

ISN
(if applicable)

NA

Cas

1752

1. Project Code ZF3095	Account Code	2. Region No. V	Sampling Co. E4E ARCS	4. Date Shipped 1/7/92	Carrier Fed Ex
Regional Information TFA 102		Sampler (Name) Cathy Kouris		Airbill Number 3110833880	
Non-Superfund Program		Sampler Signature <i>Cathy Kouris</i>		5. Ship To PACE	
Site Name		3. Type of Activity Remedial <input checked="" type="checkbox"/> Removal <input type="checkbox"/> SI: <input checked="" type="checkbox"/> PA <input type="checkbox"/> RIFS <input type="checkbox"/> CLEM <input type="checkbox"/> PIIP <input type="checkbox"/> RD <input type="checkbox"/> REMA <input type="checkbox"/> ST <input type="checkbox"/> SS <input type="checkbox"/> RA <input type="checkbox"/> REM <input type="checkbox"/> FED <input type="checkbox"/> LSI <input type="checkbox"/> O&M <input type="checkbox"/> OIL <input type="checkbox"/> NPLD <input type="checkbox"/> UST <input type="checkbox"/>		1710 Douglas Drive Minneapolis, MN 55422	
City, State EIKHART, IN		Site Split ID 7Y		ATTN: Paul Ernst	

6. Preservative
(Enter in Column D)
1. HCl
2. HNO₃
3. NaHSO₄
4. H₂SO₄
5. Other (SAS)
(Specify)
6. Not preserved

7. Sample Description
(Enter in Column A)
1. Surface Water
2. Ground Water
3. Leachate
4. Flinate
5. SolvSediment
6. Oil (SAS)
7. Waste (SAS)
8. Other (SAS)
(Specify)

CLP Sample Numbers (from labels)	A Enter # from Box 7	B Conc. Low Med High	C Sample Type: Comp / Grab	D Preservative from Box 6	E RAS Analysis				F Regional Specific Tracking Number or Tag Numbers	G Station Location Number	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Corresp. CLP Inorg. Samp. No.	K Designated Field OC
					VOA	BNA	Pea/PCB	High ARO/TOX						
EPP17	5	L	G	6	X	X	X		130626-28	B20C(5-65)	1/7/92 805	MEJK06		
EPP18	5	L	G	6	X	X			130629-31	B20E(10-12)	1/7/92 830	MEJK07		D- EPP18
EPP19	5	L	G	6	X	X			130632-35	B20E(10-12)	1/7/92 830	MEJK08		Field Duplicate
EPP20	5	L	G	6	X	X	X		130636-38	B21(10-12)	1/7/92 915			
EPP21	2	L	G	1	X				130639-40	RMW115-01	1/7/92 1005	MEJK09		
EPP21	2	L	G	6		X	X		130641-42	RMW115-01	1/7/92 1005	MEJK09		D- EPP21
EPP22	2	L	G	1	X				130643-44	RMW115-01	1/7/92 1005	MEJK10		Field Duplicate
EPP22	2	L	G	6		X	X		130645-46	RMW115-01	1/7/92 1005	MEJK10		Field Duplicate D-6
EPP23	4	L	G	1	X				130647-48	RMW115-01	1/7/92 1115	MEJK11		Field Blank B
EPP23	4	L	G	6		X	X		130649-50	RMW115-01	1/7/92 1115	MEJK11		Field Blank B

Shipment for Case complete? (Y/N)

Page 1 of 1

Sample used for a spike and/or duplicate

EPP17, EPP21

Additional Sampler Signatures

if this is the sample

Chain of Custody Seal Number

175654-55

CHAIN OF CUSTODY RECORD for MS/MSD, more sample bottles

Relinquished by: (Signature) <i>Cathy Kouris</i>	Date / Time 1/7/92 1830	Received by: (Signature)	Relinquished by: (Signature) <i>would be collected</i>	Date / Time thi's.	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Received by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	Is custody seal intact? Y/N/none

Office of Enforcement

Chicago, Illinois 60604

93ZF03

Coordinate Field Files: Yellow

Boundary File

Remarks Shipped Fed Ex to CRL
Airbill# 1060853196

Plastid Seals 1634-54

Case # or Project Code 1	Sample Number 2	Month/Day/Year 3	DESIGNATE Time 4	Grab 5
Station Number and Location 6				
Preservative: H_2SO_4 <input type="checkbox"/> HCL <input type="checkbox"/> HNO_3 <input type="checkbox"/> NaOH <input type="checkbox"/> Other <input type="checkbox"/> 8				
ANALYSES				
VOA		METALS		
ABN		CYANIDE		
PEST/PCB		9		
		Mercury		
Pesticides		Fluoride		
Herbicides		Nitrate/Nitrite		
PCB		TOC		
PCDD/PCDF		BOD		
2,3,7,8-TCDD		COB		
Ames Mutagen		TDS		
Asbestos		TSS		
Phosphorus		O&G		
TO1		Sulfate		
TO2		Chloride		
		Sulfide		
TOX		Ammonia		
CBOD		Alkalinity		
Bio-Acute		Acidity		
Bio-Chronic		TKN		
Remarks: 10				
USE FOR MS/MSD <input type="checkbox"/> 11				
Tag Number 5-198823		Lab Sample Number		

Case # or Project Code 243035	Sample Number CRMW115-01	Month/Day/Year 1/7/92	DESIGNATE Time 1005	Grab <input checked="" type="checkbox"/>
Station Number and Location CRMW115-01				
Preservative: H_2SO_4 <input type="checkbox"/> HCL <input type="checkbox"/> HNO_3 <input checked="" type="checkbox"/> NaOH <input type="checkbox"/> Other <input type="checkbox"/>				
ANALYSES				
VOA		METALS		
ABN		CYANIDE		
PEST/PCB				
		Mercury		
Pesticides		Fluoride		
Herbicides		Nitrate/Nitrite		
PCB		TOC		
PCDD/PCDF		BOD		
2,3,7,8-TCDD		COB		
Ames Mutagen		TDS		
Asbestos		TSS		
Phosphorus		O&G		
TO1		Sulfate		
TO2		Chloride		
		Sulfide		
TOX		Ammonia		
CBOD		Alkalinity		
Bio-Acute		Acidity		
Bio-Chronic		TKN		
Remarks: CASE: 17524 MEK 09				
USE FOR MS/MSD <input type="checkbox"/>				
Tag Number 5-198824		Lab Sample		



United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 918 Alexandria, VA 22313
703-557-2490 FTS 557-2490

Special Analytical Service

Packing List/Chain of Custody

Form No.

6922E

1. Project Code ZF3035		Account Code		2. Region No. IV		Sampling Co. E1E ARCS		4. Date Shipped 1/7/92		Carrier Fed Ex		6. Sample Description (Enter in Column A) 1. Surface Water 2. Ground Water 3. Leachate 4. Rinse 5. Soil/Sediment 6. Oil 7. Waste 8. Other (Specify)		7. Preservative (Enter in Column C) 1. HCl 2. HNO3 3. NaHSO4 4. H2SO4 5. NaOH 6. Other (SAS) (Specify) 7. Ice only N. Not preserved									
Regional Information TFA 102				Sampler (Name) Cathy Kouris				Airbill Number 3110834053				5. Ship To CENEC 1401 Municipal Rd Roanoke, VA 24012 ATTN: B HUTCHENSON											
Non-Superfund Program				Sampler Signature Cathy Kouris				3. Type of Activity Lead <input type="checkbox"/> RIFS <input checked="" type="checkbox"/> CLEM <input type="checkbox"/> SF <input type="checkbox"/> PA <input type="checkbox"/> RD <input type="checkbox"/> REMA <input type="checkbox"/> PRP <input type="checkbox"/> PA <input type="checkbox"/> RA <input type="checkbox"/> REM <input type="checkbox"/> ST <input type="checkbox"/> SS <input type="checkbox"/> O&M <input type="checkbox"/> OIL <input type="checkbox"/> FED <input type="checkbox"/> LSI <input type="checkbox"/> NPLD <input type="checkbox"/> UST <input type="checkbox"/>															
City, State		Site Spill ID		Sample Numbers		A Matrix Enter from Box 6		B Conc Low Med High		C Preservative Used from Box 7		D Analyte		E Regional Specific Tracking Number or Tag Number		F Station Location Identifier		G Mo/Day/Year/Time Sample Collection		H Sampler Initials		I Designated Field QC	
1				1. E-01		2		L		7		BOD		130759		CRMW025-02		1/7/92 1005					
				2. E-01		2		L		4		COD		130760		CRMW025-02		1/7/92 1005					
				3. E-02		2		L		7		BOD		130761		CRMW025-02		1/7/92 1005					
				4. E-02		2		L		4		COD		130762		CRMW025-02		1/7/92 1005					
				5. E-03		2		L		7		BOD		130763		CRMW235-01		1/7/92 1115					
				6. E-03		2		L		4		COD		130764		CRMW235-01		1/7/92 1115					
				7. E-04		2		L		7		BOD		130765		CRMW01B-01B		1/7/92 1300				Field Blank B	
				8. E-04		2		L		4		COD		130766		CRMW01B-01B		1/7/92 1300				Field Blank B	
				9.																			
				10.																			
Shipment for SAS complete? (Y/N)				Page 1 of 1				Sample Used for Spike and/or Duplicate E-03				Additional Sampler Signatures				Chain of Custody Seal Number 175672-73							

CHAIN OF CUSTODY RECORD

Relinquished by: (Signature) Cathy Kouris		Date / Time 1/7/92 1830		Received by: (Signature)		Relinquished by: (Signature)		Date / Time		Received by: (Signature)	
Relinquished by: (Signature)		Date / Time		Received by: (Signature)		Relinquished by: (Signature)		Date / Time		Received by: (Signature)	
Received by: (Signature)		Date / Time		Received for Laboratory by: (Signature)		Date / Time		Remarks		Is custody seal intact? Y/N/none	

EPA Form: 8110-3 (7/91)

NO LIMITATION

Split Samples ☐ Accepted (Signature)

☐ Declined



United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703-557-2490 FTS 557-2490

Inorganic Traffic Report & Chain of Custody Record

(For Inorganic CLP Analysis)

SAS No.
(if applicable)

NA

Case No.

17524

1. Project Code

ZF3035

Account Code

2. Region No.

IV

Sampling Co.

E4E ARCS

4. Date Shipped/Carrier

1/7/92 Fed Ex

Regional Information

TFA 102

Non-Superfund Program

Sampler (Name)

Cathy Kouris

Sampler Signature

Cathy Kouris

Airbill Number

3110833891

5. Ship To

KEYTX
8300 West PARK DR.
HOUSTON, TX 77063

ATTN: DeLa MASSOUDI

Site Name

City, State

Site Split ID

4. Type of Analysis

Lead ☒ RIFS ☒ CLEM
PA ☐ RO ☐ REMA
SSI ☐ RA ☐ REM
LSI ☐ OBM ☐ OIL
NPLD ☐ UST

6. Preservative
(Enter in Column D)

1. HCl
2. HNO3
3. NaOH
4. H2SO4
5. K2Cr2O7
6. Ice only
7. Other (SAS) (Specify)
- N. Not preserved

7. Sample Description
(Enter in Column A)

1. Surface Water
2. Ground Water
3. Leachate
4. Rinse
5. Soil/Sediment
6. Oil (SAS)
7. Waste (SAS)
8. Other (SAS) (Specify)

CLP Sample Numbers (from labels)	A Enter # from Box 7	B Conc. Low Med High	C Sample Type: Comp / Grab	D Preservative from Box 6	E - RAS Analysis								F Regional Specific Tracking Number or Tag Numbers	G Station Location Number	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Corresp. CLP Org. Samp. No.	K Designated Field QC
					Asph	Chloride	Fluoride	Low Conc.	High Conc.	pH	Conc.	Acidity						
MEJK06	5	L	G	N	X	X							130709	B20C(5-6.5H)	1/7/92 805	EPP17		
MEJK07	5	L	G	N	X	X							130710	B20E(10-12H)	1/7/92 830	EPP18		
MEJK08	5	L	G	N	X	X							130711	B20E(10-12H)	1/7/92 830	EPP19		
MEJK09	2	L	G	2	X								130712	CRMW115-01	1/7/92 1005	EPP21		
MEJK09	2	L	G	3	X								130713	CRMW115-01	1/7/92 1005	EPP21		
MEJK10	2	L	G	2	X								130714	CRMW115-01	1/7/92 1005	EPP22		
MEJK10	2	L	G	3	X								130715	CRMW115-01	1/7/92 1005	EPP22		
MEJK11	4	L	G	2	X								130716	CRMWFB-01	1/7/92 1115	EPP23		
MEJK11	4	L	G	3	X								130717	CRMWFB-01	1/7/92 1115	EPP23		

Shipment for Case complete? (Y/N)

Page 1 of 1

Sample used for a spike and/or duplicate

MEJK06, MEJK09

Additional Sampler Signatures

Chain of Custody Seal Number

additional bottles 75658-59

CHAIN OF CUSTODY RECORD

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Cathy Kouris	1/7/92 1830				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Received by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	Is custody seal intact? Y/N/none

Split Samples ☐ Accepted (Signature)

**SAMPLER INSTRUCTIONS FOR USE OF
MULTI-SAMPLE ORGANIC AND INORGANIC TRAFFIC REPORTS
HORIZONTAL FORMAT
EPA FORM #9110-1 (INORGANICS) AND
FORM 9110-2 (ORGANICS)**

1/20/89

A. Introduction - Samples and Sample Numbers

The Contract Laboratory Program (CLP) Organic and Inorganic Multi-Sample Traffic Reports (TRs) document samples shipped to CLP laboratories. You must use TRs each time you ship Routine Analytical Services (RAS) samples to a CLP laboratory. The new horizontal version of the multi-sample TRs may document up to 20 samples shipped to one CLP laboratory under one Case Number and RAS analytical program.

CLP sample types are defined by the RAS analytical program. There are currently three organic/inorganic programs: inorganic, organic, and fast-turnaround VOAs. Inorganic samples may be analyzed for Total Metals, Cyanide or both. Organic samples may be analyzed for Volatile Organics (VOAs), Base/Neutral/Acid (BNAs), Pesticide/PCBs, or any combination of these. VOA-Only samples are in a separate program from organics because of the faster turnaround provided. Inorganic samples are documented on Inorganic TRs. Organic and VOA-Only samples are documented on Organic TRs.

A CLP sample is one matrix — water or soil — never both. The CLP sample is further defined as consisting of all the sample aliquots from one station location, for each matrix and RAS analytical program. For example, let's say you were sampling at Pond A. You plan to collect one water sample and one soil/sediment sample, each to be analyzed for VOAs, BNAs, Pesticide/PCBs, Total Metals and Cyanide. All the bottles for the organic water analyses at this station — VOA vials, BNA jars, and Pesticide/PCB jars — make up one organic CLP sample, not three. All of the bottles for the organic soil analysis — VOA vial and BNA/Pesticide/PCB jars — make up the second organic CLP sample. The bottles for inorganic water analysis at this station — one for Total Metals and one for Cyanide — make up one inorganic CLP sample, not two. The bottle for inorganic soil analysis makes up the second inorganic CLP sample from Pond A. Even though you have collected a water and a soil for five different analyses from Pond A, you've collected four CLP samples — an organic water, an organic soil, an inorganic water and an inorganic soil.

The CLP generates unique Sample Numbers which must be assigned to each organic, VOA-Only, and inorganic sample. The unique CLP Sample Numbers are printed on the adhesive labels. It is your responsibility to assign this critical Sample Number correctly and to transcribe it accurately on the TR.

If the organic sample will be split between a 14 day VOA-only lab and a RAS organic lab, two CLP sample numbers for each sample must be used. The VOA only lab sample would have one number and the ABN/Pesticides/PCBs sample fraction would be assigned another number. A good rule of thumb is one sample number per sample per lab.

Organic and VOA-Only Sample Numbers are in the format XX123, and have ten labels per strip: four for extractables, two for VOAs, and four blank (extra). (See Attachment 1.) DESTROY THE UNUSED LABELS to prevent duplication of Sample Numbers.

Inorganic Sample Numbers are in the format MXX123 and have seven labels per strip: two for Total Metals, two for Cyanide and three extra (see Attachment 1). Remember that the unique Sample No. must only be used once. DESTROY THE EXTRA

Use only the labels provided to the Region in which you are sampling. CLP Sample Numbers are alphabetically coded to correspond with each Region as follows:

Letter Code			Letter Code		
Organic	Inorganic	Region	Organic	Inorganic	Region
A	MA	I	F	MF	VI
B	MB	II	G	MG	VII
C	MC	III	H	MH	VIII
D	MD	IV	Y	MY	IX
E	ME	V	J	MJ	X

REMEMBER:

- o TRs must be used for each Case No. with every shipment of samples to each CLP laboratory.
- o Organic samples, VOA-Only samples, and inorganic samples are assigned separate, unique Sample Numbers. Each sample consists of all the sample aliquots from a sample station location for analysis in one of the three analytical programs.
- o A CLP RAS sample will be analyzed as either a water or a soil sample.
- o Prevent accidental duplication of Sample Numbers by destroying unused labels.
- o Use only the Sample Numbers specific to your Region.
- o The samplers must indicate on each Traffic Report whether shipment is complete.

B. Completing the Form - Case Documentation
(Attachments 2 & 3)

Enter the Case No. and SAS No. (if applicable) at the top right of the form. Complete the boxes in the header.

Box No. 1:

Type of Activity:

If sampling is under Superfund, circle the code which describes the task of the sampling mission:

ENF	- Enforcement	RD	- Remedial Design
ER	- Emergency Response (Removal)	RIFS	- Remedial Investigation Feasibility Study
ESI	- Expanded Site Investigation	SI	- Site Investigation
NPLD	- National Priorities List Delete	ST	- State Lead
O + M	- Operations and Maintenance	STPA	- State Lead Assessment
PA	- Preliminary Assessment	STSI	- State Lead Site Investigation
RA	- Remedial Action	Other	- Please Specify

If sampling is not under the Superfund program, enter the name of program, e.g., RCRA.

Enter the site name, the city, state, and Site Spill ID in the designated spaces.

Box No. 2

Regional Information:

Enter the Region number, the name of your sampling company, and your name in the designated spaces.

Box No. 3:

Ship To:

Enter the name of the CLP laboratory and its full address in the box. Enter the name of the sample custodian or CLP contact in the box provided.

Box No. 4:

Shipping Information:

Enter the date shipped, the carrier code (e.g., F = Federal Express, P = Purolator, etc.) and the airbill number in the appropriate spaces.

**C. Completing the Form - Sample Documentation
(Attachments 2-3)**

Carefully transcribe the CLP Sample No. from the printed sample labels on the TR in the space provided.

Complete columns A through G to describe the sample:

Column A, Sample Description:

Enter the appropriate sample description code from Box 5. NOTE: Describe BLANKS as #3 "Leachate" in Column A. Write the word "Blank" in Column D, the Special Handling section. Note: Item #6 "Oil" and Item #7 "Waste" are for RAS PLUS SAS projects only. Do not ship oily samples or waste samples without making prior arrangements with SMO.

Column B, Concentration:

Organic - If sample is estimated to be low or medium concentration, enter "L". When shipping RAS Plus SAS high concentration samples (previously arranged with SMO), enter "H".

Inorganic - Enter "L" for low concentration, "M" for medium concentration, and "H" for high concentration (under previous RAS Plus SAS arrangement).

REMPIDER: Ship medium and high concentration organic and inorganic samples in metal cans.

Column C: RAS Analysis:

Check the analytical fractions requested on each sample.

Column D: Special Handling:

Use this space to specify any special handling requirements. Blank samples should be identified as such in this space. When shipping RAS Plus SAS samples you may code SAS parameters in the blank space (e.g., A = sulfate, B = Cl, etc.) and enter the codes in this column.

**D. Instructions on the Reverse
(Attachments 4-5)**

Instructions summarizing CLP sample volumes, packaging and reporting requirements are printed on the back of the TR.

[illegible]

CHAIN-OF-CUSTODY FORM

1. Enter your project # or the first six digits of the CRL log number (see page C-20).
2. Enter the case number or SAS number (do not enter the site name).
3. Obtain the full signature of sample team leader.
4. Enter the traffic report sample number or the SAS sample number.
5. List sampling dates for all samples.
6. List sampling times for all samples.
7. Indicate "grab", "composite" sample with an "X".
8. List station locations and other information . i.e.. 'blank', use for the MS/MSD. etc.
9. Enter number of containers per sample and container volume (e.g..2-40 ml).
10. List analyses individually. (VOA,ABN,PEST/PCB,MET,CN.etc.; for soils, metals and cyanide are taken from the same container, therefore the MET & CN should be together in one column.)
11. Construct column heading for "tag number" and list tag numbers for each sample container.
12. Obtain signature of sample team leader and carry out chain of custody procedures.
13. State carrier service and air bill number, lab service, and custody seal numbers are written here.

NOTE:

One Chain-Of-Custody should be filled out per shipping container. The purpose of using site code is to prevent the contract laboratory from obtaining the site name. An alternative to using a site code is to separate the copies and write the site name on your copy and the Region's copy, leaving that field blank on the lab's copy.

THIS IS A THREE COPY FORM:

The top copy goes to the CRL or CLP laboratory with the samples. The second copy (pink) goes to SMO if the samples are going to the CLP. The last copy (yellow) goes to the RSCC with other paperwork for the site (for samples shipped to the CLP).

(continued)

CHAIN OF CUSTODY FORM (continued)

If numbered CDC seals are not available from Region V, then the alternate CDC seal (a white seal that needs to be signed and dated upon use) should be used. In this case, a note should be made on the CDC form indicating that these seals were used instead of the numbered seals.

For samples coming to the CRL for analysis, the site name should be entered. The CRL log number should be used to identify the sample (instead of the traffic report number), as well as the tag number and analyses requested.

Also, list the QC bottle lot numbers in the remarks area if you are not tracking this on your sampling matrix.

REGION 6
230 South Dearborn Street
Chicago, Illinois 60604,

[illegible]

05-01657

CENTRAL REGIONAL LABORATORY SAMPLE DATA REPORT (CRL-SDR)

1. Insert assigned laboratory case number.
2. Insert site name.
3. Insert laboratory names, indicating which lab will receive the organic samples and which lab will receive the inorganic samples.
4. Insert date of shipment.
5. Insert DU code (either TFA102 for site inspection or remedial, or TGB102 for enforcement, including PRP sites).
6. Insert name of RPM (the RPM will know what the site DU code is).
7. Enter the Cerclis number.
8. Insert page number and total number of pages.
9. Enter the site/spill ID code (a 2 digit preassigned EPA code).
10. Insert CRL log number, which consists of the fiscal year, EPA assigned contractor code, sample type designation and sample number.

Example: 8 9 2 A 0 1 S 0 1
 a b c d e

a.	b.	c.	d.	e.
FY -	contractor	this should	sample type	sample
Fed.	code	be a sequential	S-sample	number
Fiscal		number	D-duplicate	
(Oct.-Sept.)		i.e..01.02.	R-field or	
		03.etc.	trip blank	

89ZA01S01 would be a sample.
89ZA01D01 would be a field duplicate of sample 89ZA01S01.
89ZA01R01 would be a field blank.

11. Insert organic traffic report number.
12. Insert inorganic traffic report number.
13. Indicate the analyses required (eg. acid-base neutral cpds., volatile organic analysis, etc.) for each sample in the appropriate section (for waters or soils) with an "X".

Note: All samples should have a unique number. If a sample is collected for filtered and unfiltered metals analyses, a separate ITR should be filled out for each bottle(the filtered and unfiltered). Each one of these samples would then be assigned a unique CRL log number. In order to distinguish between the filtered and unfiltered samples, they can be listed on the CRL-SDR with a column heading indicating 'filtered metals'.

(continued)

Central Regional Laboratory Sample Data Report (continued)

THIS IS A SINGLE COPY FORM:

This form must be filled out for all SF samples which will go to contract labs and must be sent to the Region V RSCC with the other paperwork required for a site. A copy must also be sent to SMO with the TRs and the CDCs.

The contractor codes list below should be consulted when generating the CRL log number. A minimum of approximately 10,000 unique CRL log numbers can be generated for each contractor per fiscal year using this numbering system.

<u>Contractor</u>	<u>Code</u>
REM II	R
REM III	VA
REM IV	H
REM V	VB
ARCS/Other	
Warzyn	ZA
Black & Veatch	ZB
CH2	ZC
Donahue	ZD
E&E	ZE
PRC	ZF
Weston	ZG
UV Science	ZH
EPA Personnel	S
RCRA	K
TES	J
TAT	VT
FIT	F
MDNR	M
WONR	X
MPCA	Y

THIS FORM IS TO BE USED FOR SAMPLES SENT TO CONTRACT ONLY

[illegible]

DIOXIN SAMPLE DOCUMENTATION
AND SHIPMENT INSTRUCTIONS

July 1988

Instructions for Completing DSR Form

A separate Dioxin Shipment Record (DSR) form is to be completed for each shipment of samples to a laboratory. First, enter the Case number on the top right corner of the DSR form, where indicated. The Case number is the identifying number that was assigned by SMO at the time the sampling was scheduled. This is followed by the Batch number, which is assigned by the sampler when samples are packed for shipment to the laboratory(ies).

The Batch number represents one shipment of up to twenty-four (24) samples from one specific location to one laboratory on one day and is assigned sequentially. For example, the first shipment of samples in a Case would be identified as Batch #1, the second shipment would be Batch #2, etc. When sampling occurs over several days, care must be taken not to repeat Batch numbers within the Case.

The use of Batch numbers allows for identification of groups of samples within a Case that are shipped to different laboratories and/or that are shipped on different days. The Batch number may also be used to signify a group of samples collected at a specific location within the overall site perimeter, should the site encompass a large geographical area.

Next, complete header information, excluding the areas on the top right of the form that are set off by bold lines. These areas are for laboratory use.

NEW INSTRUCTIONS WILL BE PROVIDED WHEN THE FORM IS REVISED.

USEPA Contract Laboratory Program
 Service Management Office
 P.O. Box 918 Alexandria, Virginia 22313
 PHS 8-557-2490 703/557-2490

CASE NO: 7000	BATCH NO: 01
SAS ID: NYA	

CLP DRUM SHIPMENT RECORD

Site Name: BUSTY DRUM SITE City & State: Bucksville, Fla. EPA Site ID: 24 Tlot: 1 2 3 4 5 6 7 (circle one)	Region Report: IV Sampling Contact: Joe Sampler / Ginc (name) / (company) Sampling Date: 1/15/87	Ship To: True Value Analytical Tulsa, OK Date Shipped: 1/16/87
-------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------

Instructions: 1) Ship all samples in sealed drums, in outer case.
 2) Seal drums according to VCI or drum organic chemicals.
 3) Sample Description: **Soil/Sludg**; 4 on/drum to place for **Analysis**; 7 liters/drum in outer glass. Send one 4 liter sample/drum for lab QC.

SAMPLE NUMBER	MATRIX (check one/sample)					RECEIVED		SAS ONLY	
	SOIL / SLUDG	AQUEOUS	EQUIP WASH (ORG SOLV)	OTHER (SAS ONLY)	SAMPLE TO ANALYZE (check one)	SAMPLE TO DUPLICATE (check one)	SAMPLE LOCATION (for other field desc)	SPECIFY ADDITIONAL SAS ANALYSIS	ANALYST
DD011201	X						D01-1		
DD011202	X						D01-2		
DD011203	X						D01-3		
DD011204	X						D02-1		
DD011205	X						D02-16		
DD011206			X				D02-2		
DD011207	X						D02-3		
DD011208	X				X		D03-1		
DD011209	X						D03-2		
DD011210	X						D03-3		
DD011211	X						D04-1		
DD011212	X					X	D04-2		
DD011213	X						D04-3		
DD011214	X						D05-1		
DD011215	X						D05-2		
DD011216	X						D06-1		
DD011217	X						D06-2		
DD011218	X						D06-3		
DD011219	X						D07-1		
DD011220	X						D07-2		
DD011221	X						D07-3		
DD011222		X			X		D08-1		
DD011223		X				X	D08-2		
DD011224		X					D08-3		

WHITE—SASO Copy YELLOW—Region Copy PINK—Lab Copy or Return to SASO GOLD—Lab Copy

ENVIRONMENTAL PROTECTION AGENCY
Central Regional Laboratory Analysis Request Form

1. Insert sampler name, i.e., CDM, Fit, ELE, Weston, or RPM name.
2. Insert sampling date.
3. Insert DU number (Y905 or Y306).
4. Insert site name.
5. Insert priority code (if any).
6. Insert CRL log numbers (see page C-20).
7. Insert sample tag number.
8. Indicate analyses required by placing an "X" in the appropriate column for each sample.

Note: The analytes that are routinely analyzed for at the Central Regional Laboratory are listed in Appendix F which was included in the Transmittal of Latest CRL Method Capabilities and Requirements, sent from the CRL Quality Control Coordinator on February 23, 1987 to All Superfund Sample Requestors and QAPP Preparers.

- Normal turnaround time for the CRL is 21 days from receipt of samples. Priority 1 analysis requires a 5 day turnaround, and must be requested via a memo from the WMD Director to the ESD Director in advance of sampling. Requests for shorter than the 21 day (and greater than 5 days) turnaround must be addressed to the CRL Director.

**ENVIRONMENTAL PROTECTION AGENCY
FOR THE TEAM: METALS, MINERALS-NUTRIENTS**

DIVISION/BRANCH _____ SAMPLE DATE _____ LAB ARRIVAL DATE _____ DIS DATE _____
 PRIORITY _____ CONTRACTOR _____

DIVISION/BRANCH _____ PRIORITY _____ CONTRACTOR _____
 DU NUMBER _____ DATA SET NUMBER _____ STUDY _____

[illegible]

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Appendix D

Contract Laboratory Program Sample Collection Requirements
For Routine Waters and Soils. High Hazard Liquids and Solids
and Dioxin Samples

D-1
through
D-3

**CLP Sample Collection Requirements For Routine
Water and Soil Samples for Organics and Inorganics
Low, Medium and High Concentration and Dioxin Samples**

ANALYSIS	REQUIRED VOLUME	# OF CONTAINERS	CONTAINER TYPE	PRESERVATIVE
<hr/>				
<u>WATER SAMPLES</u>				
Metals-low level (Hg included)	1 liter	1	1 liter polyethylene bottle	HNO ₃ to a pH<2
*Metals-medium level (Hg included)	1 liter	1	16 oz. wide wide mouth bottle	HNO ₃ to a pH<2
Cyanide- low level	1 liter	1	1 liter polyethylene bottle	NaOH to a pH>12 Cool, 4° C **1.2g ascorbic acid
*Cyanide-medium level	1 liter	1	1 16 oz. wide wide mouth bottle	NaOH to a pH>12 Cool, 4° C **1.2g ascorbic acid
Extractables-low level	1 gallon	2	80 oz. amber glass bottles	Cool, 4° C
		or		
		4	1 liter amber glass bottles	
*Volatile-low or medium level	80 ml	2	40 ml glass vials	Cool, 4° C. Preserve low level samples with 1-2 drops HCl to pH<2. Samples must be free of headspace.
<hr/>				
<u>SOIL SAMPLES</u>				
*Metals and cyanide, low or medium level	8 oz.	1	8 oz. wide mouth glass bottles	
		or		
		2	4 oz. wide mouth glass bottles	
*Extractables-low or medium level	6 oz.	1	8 oz. wide mouth glass bottles	Cool, 4° C
		or		
		2	4 oz. wide mouth glass bottles	
*Volatiles-low or medium level	240 ml	2	120 ml wide mouth glass vial	Cool, 4° C: vial must full and free of headspace

Sample collection Requirements (continued)

ANALYSIS	REQUIRED VOLUME	# OF CONTAINERS	CONTAINER TYPE	PRESERVATIVE
<u>HIGH HAZARD SAMPLES</u>				
*Liquid Samples- organic and inorganic	4 oz.	2	4 oz. wide mouth glass bottle	Note: One bottle is for inorganics. the other is for organics
*Solid Samples- organic and inorganic	4 oz.	2	4 oz. wide mouth glass bottle	(same as above)
<u>DIOXIN SAMPLES</u>				
*2,3,7,8-TCDD	4 oz.	1	4 oz. wide mouth glass bottle	

* All medium level, high hazard, and dioxin samples must be sealed in metal paint cans for shipment. The outer metal can must be labeled with the number of samples contained inside.

** Should only be used in the presence of residual chlorine.

All low level sample containers must be enclosed in clear plastic bags before placing in the cooler for shipment.

All samples should be shipped in ice chests packed with non-combustible, absorbent packing material (vermiculite) surrounding the plastic enclosed sample bottles (or metal cans containing samples).

Traffic Reports, Dioxin Shipment Records, SAS Packing Lists, Chain of Custody Records and any other shipping/sample documentation accompanying the shipment must be enclosed in a waterproof plastic bag and taped to the underside of the cooler lid.

Coolers must be sealed with Region V numbered custody seals in such a manner that the custody seals would be broken if the cooler were opened. Water proof tape must cover the custody seals.

Water samples for organic matrix spike/matrix spike duplicate analysis must be collected at double the volume specified for Extractables and triple the volume specified for Volatiles.

The RAS/SDUs require lab QC (MS/MSD for organics, a spike and a duplicate for inorganics) to be done at a frequency of one set of QC for each 20 samples (or less) of the same matrix in each Case. (It is important that the traffic reports contain a statement indicating whether sample shipment is complete or if more samples will be coming to the lab under that Case number so that the lab can proceed with the analyses.) If more than 20 water samples are

CLP Sample Collection Requirements (continued)

collected for a Case, extra volume for the MS/MSD analyses must be collected for every group of 20 organic samples or less.

For water and soil samples, field blanks and duplicates should be supplied at the frequency prescribed in the approved QAPP for the site.

No additional soil volume is required for laboratory analysis of MS/MSD (organics) or spikes and duplicates (inorganics).

The water Volatiles sample must be preserved with 4 drops of 1:1 HCl or 2 drops of concentrated HCl to a pH<2. This is due to a new CLP holding time of 10 days (instead of 7 days).



Appendix B

APPENDIX B

SOIL GAS AND GEOPROBE SOIL SAMPLING PROCEDURES

DRAFT
SOIL GAS SAMPLING PROCEDURES

PROCEDURE

TITLE

SG-1

SOIL GAS SAMPLING - POST RUN TUBING (PRT) SYSTEM
OPERATION

PREPARED BY _____ APPROVED BY _____

PROCEDURE NO. _____ REVISION NO. _____

DATE _____

TT QA
FIELD SOP
Page 1 of 6

FIELD PROCEDURE NO. SG-1

SOIL GAS SAMPLING - POST RUN TUBING (PRT) SYSTEM OPERATION

SUMMARY OF METHOD:

Soil gas samples are collected using a temporary "grab" (one-time) sample method referred to as the Post Run Tubing (PRT) method (refer to Attachment 1 for description). The PRT system is used to collect soil gas samples from discrete depths within the soil vadose zone. The method uses 1-inch O.D. X 0.5-inch I.D. percussion driven hollow steel threaded probe rods with a threaded expendable point holder to collect soil gas samples. The probe rods and expendable drive point are driven to depth using a hydraulic soil probe machine. If the surface material consists of concrete or asphalt, a 1.5-inch diameter carbide-tipped concrete bit is used to hammer through the pavement using the hydraulic soil probe hammer. After the rods and drive point have been driven to the required sampling depth the rods are retracted a few inches leaving behind the expendable steel drive point and a column of soil is exposed for vapor sampling. A length of 1/4-inch O.D. polyethylene tubing connected to an aluminum barbed fitting that contains an o-ring is threaded into the expendable point holder. The tubing is rotated clockwise from above to thread the barbed fitting into the female threaded expendable point at the base of the probe rods. The polyethylene tubing is connected to a vacuum pump with silicon tubing at the surface that will be used to purge three to five (3-5) volumes of soil gas from the PRT system tubing. The vacuum pump is fitted with a vacuum pressure guage to assure that there is no impedance to gas flow caused by low-permeability or water-saturated soils.

Once the system has been purged, a vacuum chamber box fitted with an empty 0.5 liter tedlar bag is hooked up to the PRT system tubing. A vacuum pump is connected to the outside of the vacuum chamber box and a vacuum is applied inside the box creating negative pressure inside of the box and tedlar bag. The air inlet port that is connected to the tedlar bag is opened from outside the box allowing soil gas to be drawn into the bag. The vacuum chamber box contains a clear glass viewing window to allow the sampler to determine when to close the inlet port after the bag has been inflated with the sample and not overfilled. The chamber box can be opened and the sealed tedlar bag with the sample can be withdrawn for lab analysis.

The 0.5 liter soil gas sample is collected from each sampling probe within one minute of purging. The sample is subsampled according to analytical requirements and replicates are injected into the gas chromatograph for documentation of reproducibility. More than two injections may be necessary where there are multiple contaminants that require different sample volumes for chromatographic analysis.

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After the soil gas sample has been collected the expendable point remains in the soil and the probe rods are removed from the ground and the hole is sealed with granular bentonite. Asphalt or concrete patch is used to cap holes that have been created through paved or concrete areas.

SUPPLIES:

- Hydraulic soil probe machine
- 14'X7' enclosed Pace American support trailer
- 3500 watt gasoline powered generator
- ~ 40 feet of 1-inch diameter steel probe rods with an expendable point holder
- 1.25-inch diameter steel expendable drive points
- miscellaneous hand and probe tools
- 1.5-inch diameter carbide-tipped bit and drill steel
- required lengths of 1/4-inch I.D. silicon and 1/4-inch O. D. polyethylene tubing
- vacuum chamber box with vacuum port and sample port
- vacuum pump with pressure and volume gauge
- Tedlar bags (0.5 liter) with septa port
- 50 ul, 1 ml, 10 ml glass syringes
- granular bentonite
- asphalt and concrete patch material

PROCEDURE

1. Determination of Sampling Locations:

1.1 Initial sampling locations will be determined by the client (CDM) prior to the start of the project.

1.2 Remaining sample locations may be determined by the following:

1.2.1 Client:

1.2.1.1 All sampling locations set up on a marked grid system.

1.2.1.2 Client decides location of remaining sampling locations based on results of initial study.

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1.2.2. Client and TERRA-TRACE Personnel:

1.2.2.1. Client and TERRA-TRACE personnel decide location of remaining sampling locations based on results of initial sampling locations.

2. Checks for Sampling System Contamination:

2.1. Prior to use, a sub-sampling syringe is blanked to determine if contamination exists in the syringes (Landmark Procedure GC103a - Appendix B).

2.2. Prior to sample probe placement, an ambient air sample is drawn above ground in the vicinity of the sampling area.

2.3. Concurrently, a system blank will be drawn through randomly selected probe tools and PRT fittings into a tedlar bag and analyzed using the analytical system.

2.4. The results of the ambient air and system blank samples are compared to determine the presence of contamination in the sampling apparatus.

3. Sampling Probe Placement

3.1. The hydraulic soil probe is located over the sampling location and the probe mast is unfolded centered vertically over the sample location.

3.2. If concrete or asphalt are present a concrete bit and drill steel are connected to the probe hammer to penetrate the surface pavement.

3.3. Precleaned sample probe rods and PRT fittings are removed from storage and an expendable drive point is fitted to the end of the probe rods.

3.4. A drive cap is fitted to the top of the probe rods and the rods are pushed and driven into the soil to the required sampling depth.

3.5. A pull cap is fitted to the top of the probe rods and the rods are extracted approximately 6-inches leaving the expendable point behind and exposing a cavity of soil for sampling.

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4. Soil Gas Sample Collection

4.1 An aluminum barbed PRT fitting containing an o-ring is connected to a required length of 1/4-inch O.D. polyethylene tubing.

4.2 The tubing and PRT fitting are lowered down the inside of the hollow probe rods and rotated clockwise to thread the PRT fitting into the top of the expendable point holder.

4.3 At the surface, the polyethylene tubing is connected to a vacuum pump with silicon tubing at the surface that will be used to purge three to five (3-5) volumes of soil gas from the PRT system tubing and soil cavity. The vacuum pump is fitted with a vacuum pressure and air volume guage to assure that there is no impedance to gas flow caused by low-permeability or water-saturated soils.

4.4 The vacuum pump is turned on and evacuates a separate closed vacuum cylinder with a pressure up to 27-inches of mercury. Once the cylinder is pressurized an initial reading of both pressure in inches of mercury and volume in liters of air are taken directly from the pressure/volume guage prior to opening the cylinder valve. If after applying a vacuum to the PRT system no response is seen on the guage then the probe rods must be pulled up incrementally until a sample can be collected. If the rods have to be pulled back then repeat steps 4.2 through 4.4.

5. Sample Collection

5.1 Once the PRT system has been purged, a vacuum chamber box fitted with an empty 0.5 liter tedlar bag is hooked up to the PRT system tubing. The 0.5 liter soil gas sample is collected from each sampling probe within one minute of purging.

5.2 A personal sampling vacuum pump set at between 1 to 5 liters/min. is connected to the outside of the vacuum chamber box port with silicon tubing to evacuate air from the inside of the box creating negative pressure inside of the box and tedlar bag.

5.3 The air inlet port, that is connected to the tedlar bag which is in a negative pressure atmosphere, is opened from out side the box allowing soil gas to be drawn into the bag. The vacuum chamber box contains a clear glass viewing window to allow the sampler to determine when to close the inlet port after the bag has been inflated with the sample so as not to overfill and explode the bag.

5.4 The chamber box can be opened and the sealed tedlar bag with the sample can be withdrawn for lab analysis.

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5.5 The sample is subsampled according to analytical requirements and replicates are injected into the gas chromatograph for documentation of reproducibility. More than two injections may be necessary where there are multiple contaminants that require different sample volumes for chromatographic analysis.

6. Sampling Log Book and Documentation

6.1 A separate hard bound water proof notebook will kept with the TERRA-TRACE sampling team to record all necessary information during sampling events.

6.2 The notebook will include the date and time (in military notation) of each event, the names of sampling personnel, and a daily summary of activities for each day of sampling.

6.3 Individual sample collection data sheets will be filled for each sample collected. This information will be included in the summary Sampling Data Table and will include the following information:

6.3.1 Time (Military notation).

6.3.2 Sample Number (use "SG-" prefix or client's numbering system, whichever was established at the beginning of the project).

6.3.3 Sampling Depth in feet.

6.3.4 Purge pressure and volume.

6.3.5 Purge evacuation time in seconds.

6.3.6 Sample volume collected (cc)

6.3.7 Number of attempts (borings) and drive points used.

6.3.8 Notes and any additional information requested by the client. This includes but is not limited to; description of the sampling location and general area, weather conditions, ground conditions, asphalt, concrete, soil appearance, surface water, odors, vegetation, backfill procedures and materials, etc.

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7. Other Record Keeping:

7.1 Client-provided data sheets are filled out, if required.

7.2 Sampling location is marked on the site map. Site map should have scale, north arrow, and prominent site features.

8. Deactivation of Sampling Apparatus:

8.1 Disconnect vacuum pump from vacuum chamber box.

8.2 Unthread PRT fitting and remove tubing and fitting from probe rods and expendable point holder.

8.3 Attach pull cap to rods and remove them from the soil.

8.4 Backfill boring with granular bentonite and replace the top 6 inches with native soil or repair with asphalt or concrete patch.

9. Sampling Equipment Decontamination

9.1 All downhole sampling equipment including rods and PRT fittings will be properly decontaminated by scrubbing and washing with Alconox soap and water followed by a triple distilled water rinse. Let dry and store tools in clean place on hydraulic soil probe rig or in trailer.

9.2 Glass Syringes with Detachable Needles (refer to Landmark's Field Procedure No. GC117 in Attachment A).

ATTACHMENT 1

POST-RUN TUBING OPERATION

Soil Gas Sampling — PRT System Operation

Basics

Using the Post-Run Tubing System, one can drive probe rods to the desired sampling depth, then insert and seal an internal tubing for soil gas sampling. The usual Geoprobe probe rods and driving accessories and the following tools are required:

- PRT Expendable Point Holder
- PRT Adapter
- Selected PRT Tubing

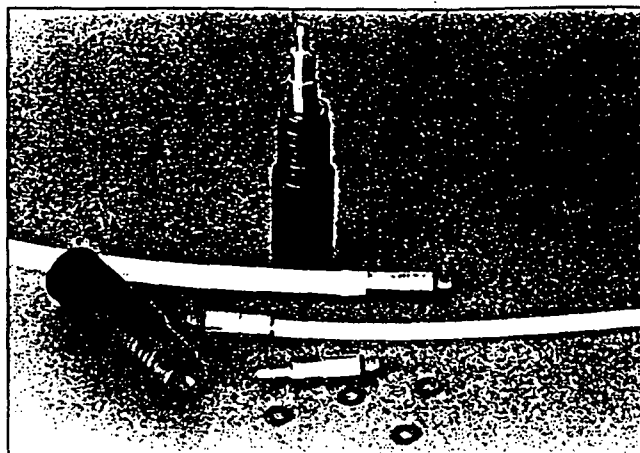
Preparation

1. Clean all parts prior to use. Install O-rings on the PR-13B and the PRT adapter.
2. Inspect the probe rods and clear them of all obstructions.
3. TEST FIT the adapter with the PRT fitting on the expendable point holder to assure that the threads are compatible and fit together smoothly.

NOTE: PRT fittings are left-hand threaded.

4. Push the adapter into the end of the selected tubing. Tape may be used on the outside of the adapter and tubing to prevent the tubing from spinning freely around the adapter during connection — especially when using Teflon tubing (Figure 1).

REMEMBER: The sample will not contact the outside of the tubing or adapter.



PRT SYSTEM PARTS

PRT Expendable Point Holder, PRT Adapters, Tubing, and O-rings.

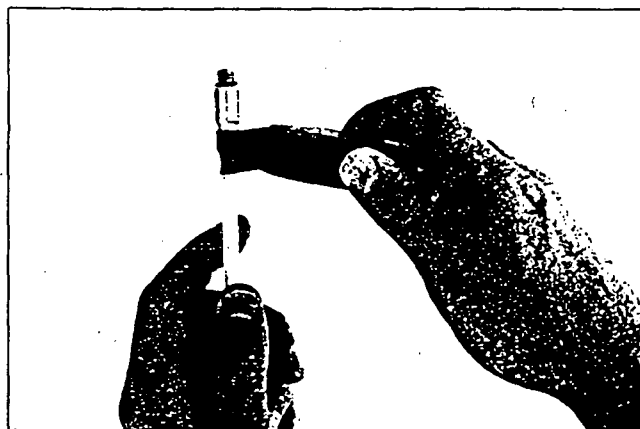


Figure 1. Securing adapter to tubing with tape. NOTE: Tape does not contact soil gas sample.

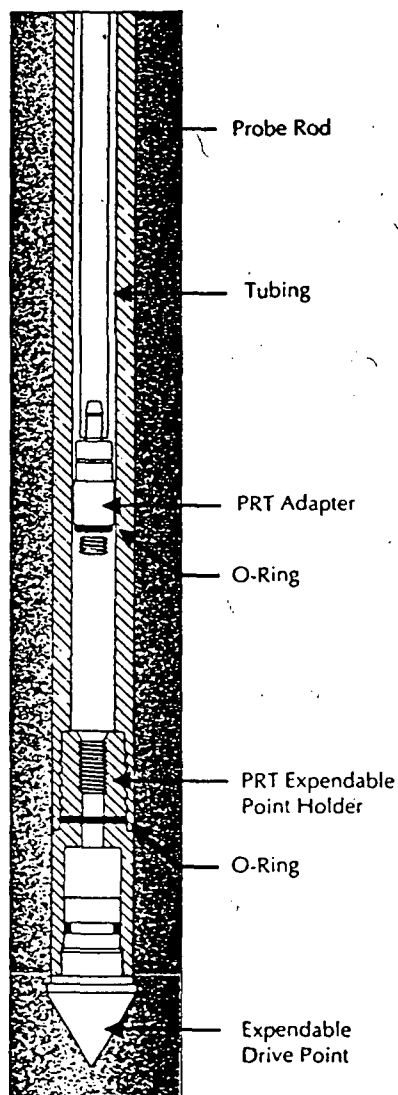


Figure 2. Insertion of tubing and PRT adapter.



Figure 3. Engaging threads by rotating tubing.

Soil Gas Sampling — PRT System Operation



A cross section of probe rods driven to depth and then retracted to allow for soil gas sampling. The PRT adapter and tubing are now fed through the rods and rotated to form a vacuum-tight connection at the point holder. The result is a continuous run of tubing from the sample level to the surface.

Probing

Drive the PRT tip configuration into the ground. Connect probe rods as necessary to reach the desired depth. After depth has been reached, disengage the expendable point by pulling up on the probe rods. Remove the pull cap from the top probe rod, and position the Geoprobe unit to allow room to work.

Connection

1. Insert the adapter end of the tubing down the inside diameter of the probe rods (Figure 2).
2. Feed the tubing down the rod bore until it hits bottom on the expendable point holder. Allow about 2 ft. (610 mm) of tubing to extend out of the hole before cutting it.
3. Grasp the excess tubing and apply some downward pressure while turning it in a counterclockwise motion to engage the adapter threads with the expendable point holder (Figure 3).
4. Pull up lightly on the tubing to test engagement of the threads. (Failure of adapter to thread could mean that intrusion of soil may have occurred during driving of probe rods or disengagement of drive point.)



Soil Gas Sampling — PRT System Operation

Sampling

1. Connect the outer end of the tubing to the Silicone Tubing Adapter and vacuum hose (or other sampling apparatus).
2. Follow the appropriate sampling procedure for collecting a soil gas sample (Figure 1).

Removal

1. After collecting a sample, disconnect the tubing from the vacuum hose or sampling system.
2. Pull up firmly on the tubing until it releases from the adapter at the bottom of the hole. (Taped tubing requires a stronger pull.)
3. Remove the tubing from the probe rods. Dispose of polyethylene tubing or decontaminate Teflon tubing as protocol dictates.
4. Retrieve the probe rods from the ground and recover the expendable point holder with the attached PRT adapter.
5. Inspect the O-ring at the base of the PRT adapter to verify that proper sealing was achieved during sampling. The O-ring should be compressed. This seal can be tested by capping the open end of the point holder applying vacuum to the PRT adapter.
6. Prepare for the next sample.



Figure 1. Taking a soil gas sample for direct injection into a GC with the PRT system.

DRAFT
SOIL SAMPLING PROCEDURES

PROCEDURE

TITLE

SS-1

GROUNDWATER SAMPLING - RETRACTABLE SCREEN POINT
(RSP) SYSTEM OPERATION

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FIELD PROCEDURE NO. SS-1

SOIL SAMPLING - SYSTEM OPERATION

SUMMARY OF METHOD:

Specific interval or continuous soil sampling can be accomplished using a piston style probe-driven samplers. The piston sampler, unlike conventional split-spoon samplers, remain completely sealed while they are being driven to the desired sampling depth. The sampler contains an internal piston that is manually released upon reaching the desired sampling interval allowing soil to enter the sampling tube so it can be brought to the surface for inspection or analysis.

The piston samplers are fitted with liners made of either clear polybutyrate, Teflon, stainless steel, or brass depending on the specific sampling requirements. Once withdrawn from the sampler, the liners can be separated with a knife for inspection or capped and sent for laboratory analysis without further sample disruption. The most common lined piston sampler is the Large Bore sampler which collects a soil sample 1.125 " in diameter by 24 " long that is approximately 400 ml in volume. If the surface material consists of concrete or asphalt, a 2.0-inch diameter carbide-tipped concrete bit is used to hammer through the pavement using the hydraulic soil probe hammer. After the rods and RSP have been driven to the required sampling depth the rods are retracted approximately 36 inches allowing an internal 0.75-inch O.D. X 36-inch long 316 stainless steel wire-wrapped screen with 0.01-inch slots to drop through the bottom of the RSP into the aquifer cavity below leaving behind the expendable steel drive point. Refer to Attachment 2 for a detailed description of the Large Bore sampler.

Once the soil sample has been collected the probe rods and piston sampler are removed from the soil and the hole is sealed with granular bentonite. If necessary, asphalt or concrete patch is used to cap holes that have been created through paved or concrete areas.

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SUPPLIES:

- Hydraulic soil probe machine
- 14'X7' enclosed Pace American support trailer
- 3500 watt gasoline powered generator
- ~ 40 feet of 1-inch diameter steel probe rods
- 1.5-inch diameter Steel piston soil sampler with extension rods
- miscellaneous hand and probe tools
- 2.0-inch diameter carbide-tipped bit and drill steel
- clear acetate soil sample liners
- sample containers
- granular bentonite
- asphalt and concrete patch material

PROCEDURE

1. Determination of Sampling Locations:

1.1 Initial sampling locations will be determined by the client (CDM) prior to the start of the project.

1.2 Remaining sample locations may be determined by the following:

1.2.1 Client:

1.2.1.1 All sampling locations set up on a marked grid system.

1.2.1.2 Client decides location of remaining sampling locations based on results of initial study.

1.2.2. Client and TERRA-TRACE Personnel:

1.2.2.1. Client and TERRA-TRACE personnel decide location of remaining sampling locations based on results of initial sampling locations.

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2. Checks for Soil Sampling System Contamination:

2.1 All reuseable sampling equipment (ie. probe rods and piston sampler) will be thoroughly decontaminated prior to collection of each sample.

2.2 A decontaminated section of probe rods and a piston sampler will have distilled and deionized laboratory grade water run through and over the them. The rinsate water will be collected and containerized for analysis of contamination.

3. Sampling Probe Placement

3.1 The hydraulic soil probe is located over the sampling location and the probe mast is unfolded centered vertically over the sample location.

3.2 If concrete or asphalt are present a concrete bit and drill steel are connected to the probe hammer to penetrate the surface pavement.

3.3 Precleaned sample probe rods and piston sampler fittings are removed from storage.

3.4 A drive cap is fitted to the top of the probe rods and the rods and closed piston sampler are pushed and driven into the soil to the required sampling depth.

4. Soil Sample Collection

4.1 The drive cap is removed and the threaded extension rods are connected together with couplings and lowered down the hollow probe rods and threaded into the piston stop pin.

4.2 As the extension rods are turned clockwise the left-hand threaded stop pin is backed out and removed from the sampler. The extension rods and stop pin are brought to the surface.

4.3 The drive cap is placed back onto the top of the rods and the sampler is driven approximately two feet to collect a soil sample.

4.4 The drive cap is replaced with a pull cap and the rods and sampler are removed from the ground. The sampler is opened at the surface and the acetate liner is cut exposing the sample which can be collected in a container for analysis.

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5. Sampling Log Book and Documentation

5.1 A separate hard bound water proof notebook will kept with the TERRA-TRACE sampling team to record all necessary information during sampling events.

5.2 The notebook will include the date and time (in military notation) of each event, the names of sampling personnel, and a daily summary of activities for each day of sampling.

5.3 Individual sample collection data sheets will be filled for each sample collected. This information will be included in the summary Sampling Data Table and will include the following information:

5.3.1 Time (Military notation).

5.3.2 Sample Number (use "SS-" prefix or client's numbering system, whichever was established at the beginning of the project).

5.3.3 Sampling Depth or interval in feet.

5.3.4 Sample Collection Method

5.3.5 Sample volume collected (oz)

5.3.6 Number of attempts (borings) used.

5.3.7 Notes and any additional information requested by the client. This includes but is not limited to; description of the sampling location and general area, weather conditions, ground conditions, asphalt, concrete, soil appearance, surface water, odors, vegetation, backfill procedures and materials, etc.

6. Other Record Keeping:

6.1 Client-provided data sheets are filled out, if required.

6.2 Sampling location is marked on the site map. Site map should have scale, north arrow, and prominent site features.

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7. Deactivation of Sampling Apparatus:

- 7.1 Attach pull cap to rods and remove rods and sampler from the soil.
- 7.2 Remove soil sample from sampler and discard clear acetate sample liner, if applicable.
- 7.3 Backfill boring with granular bentonite and replace the top 6 inches with native soil or repair with asphalt or concrete patch.

8. Sampling Equipment Decontamination

- 8.1 All downhole sampling equipment including rods and piston sampler fittings will be properly decontaminated by scrubbing and washing with Alconox soap and water followed by a triple distilled water rinse. Let dry and store tools in clean place on hydraulic soil probe rig or in trailer.

ATTACHMENT 2

LARGE BORE SOIL SAMPLER OPERATION

GEOPROBE AT-660 SERIES LARGE BORE SOIL SAMPLER

Standard Operating Procedure (SOP)

Technical Bulletin No. 93-660

PREPARED: 9/21/1993

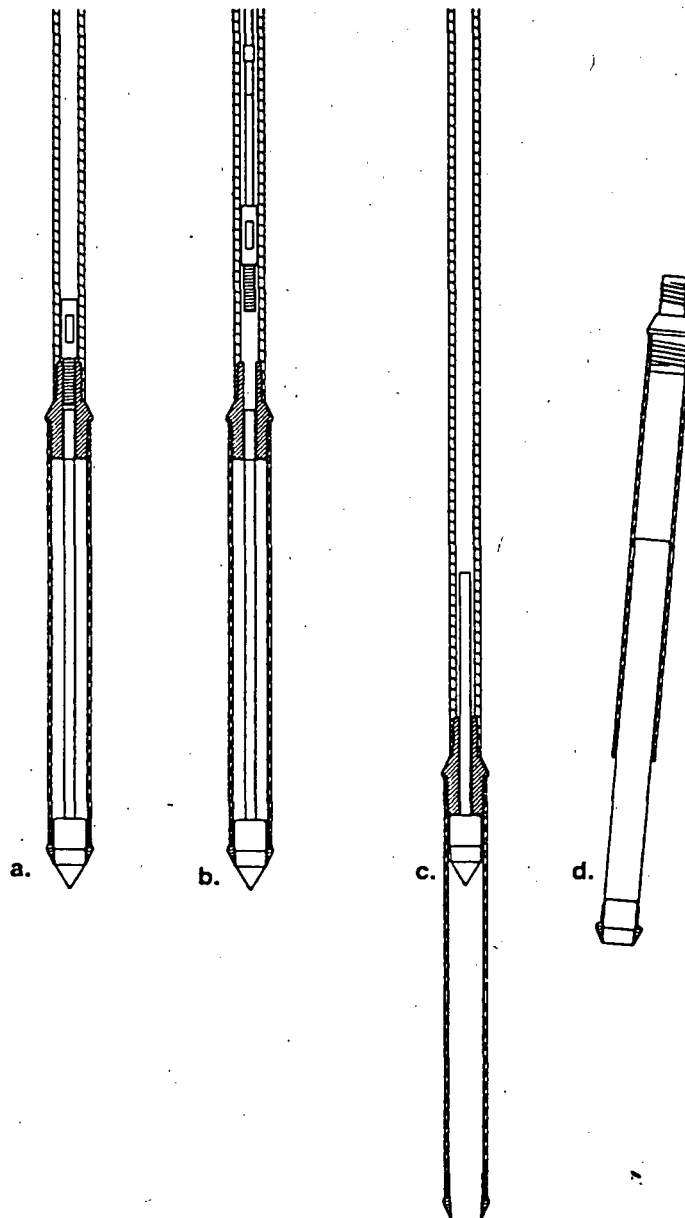


Figure 1. Driving and Sampling with the Large Bore Soil Sampler.

- a. Driving the Sealed Sampler
- b. Removing the Stop-pin
- c. Collecting a Sample
- d. Recovering Sample in Liner

1.0 OBJECTIVE

The objective of this procedure is to collect a discrete soil sample at depth and recover it for visual inspection and/or chemical analysis.

2.0 BACKGROUND

2.1 Definitions

Geoprobe*: A vehicle-mounted, hydraulically-powered, soil probing machine that utilizes static force and percussion to advance small diameter sampling tools into the subsurface for collecting soil core, soil gas, or ground water samples.

**(Geoprobe is a registered trademark of Kejr Engineering, Inc., Salina, Kansas.)*

Large Bore Sampler: A 24-inch long x 1-3/8-inch diameter piston-type soil sampler capable of recovering a discrete sample that measures up to 320 ml in volume, in the form of a 22-inch x 1-1/16-inch core contained inside a removable liner.

Liner: A 24-inch long x 1-1/8-inch diameter removable/replaceable, thin-walled tube inserted inside the Large Bore Sampler body for the purpose of containing and storing soil samples. Liner materials include brass, stainless steel, Teflon, and clear plastic (either PETG or cellulose acetate butyrate).

2.2 Discussion

In this procedure, the assembled Large Bore Sampler is connected to the leading end of a Geoprobe brand probe rod and driven into the subsurface using a Geoprobe machine. Additional probe rods are connected in succession to advance the sampler to depth. The sampler remains sealed (closed) by a piston tip as it is being driven. The piston is held in place by a reverse-threaded stop-pin at the trailing end of the sampler. When the sampler tip has reached the top of the desired sampling interval, a series of extension rods, sufficient to reach depth, are coupled together and lowered down the inside diameter of the probe rods. The extension rods are then rotated clock-wise (using a handle). The male threads on the leading end of the extension rods engage the female threads on the top end of the stop-pin, and the pin is removed. After the extension rods and stop-pin have been removed, the tool string is advanced an additional 24 inches. The piston is displaced inside the sampler body by the soil as the sample is cut. To recover the sample, the sampler is recovered from the hole and the liner containing the soil sample is removed. The operation is illustrated in Figure 1.

3.0 REQUIRED EQUIPMENT

The following equipment is required to recover soil core samples using the Geoprobe Large Bore Sampler and driving system. (Figure 2.) Note that the sample liners for the Large Bore Sampler are available in four different materials. Liner materials should be selected based on sampling purpose, analytical parameters, and data quality objectives.

Large Bore Sampler Parts	Quantity	Part Number
STD Piston Stop-pin, O-ring	1	AT-63, 63 R
LB Cutting Shoe	1	AT-660
LB Drive Head	1	AT-661
LB Sample Tube	1	AT-662
LB Piston Tip	1	AT-663
LB Piston Rod	1	AT-664
LB Clear Plastic Liner	variable	AT-665
LB Brass Liner	variable	AT-666
LB Stainless Steel Liner	variable	AT-667
LB Teflon* Liner	variable	AT-668
LB Cutting Shoe Wrench	1	AT-669
Vinyl End Caps	variable	AT-641
Teflon* Tape	variable	AT-640 T

**(Teflon is a Registered Trademark of E.I. du Pont de Nemours & Co.)*

Geoprobe Tools	Quantity	Part Number
Probe Rod (3 foot)	variable	AT-10 B
Probe Rod (2 foot)	1	AT-10 B
Probe Rod (1 foot)	1	AT-10 B
Drive Cap	1	AT-11 B
Pull Cap	1	AT-12 B
Extension Rod	variable	AT-67
Extension Rod Coupler	variable	AT-68
Extension Rod Handle	1	AT-69

Optional

LB Manual Extruder	1	AT-659 K
Extension Rod Jig	1	GW-469
LB Pre-Probe	1	AT-146B

Additional Tools

Vise Grips
Open Ended Wrench (3/8-inch)
1-inch or Adjustable Wrench

4.0 OPERATION

4.1 Decontamination

Before and after each use, thoroughly clean all parts of the soil sampling system according to project specific requirements. A clean, new liner is recommended for each use. Parts should also be inspected for wear or damage at this time.

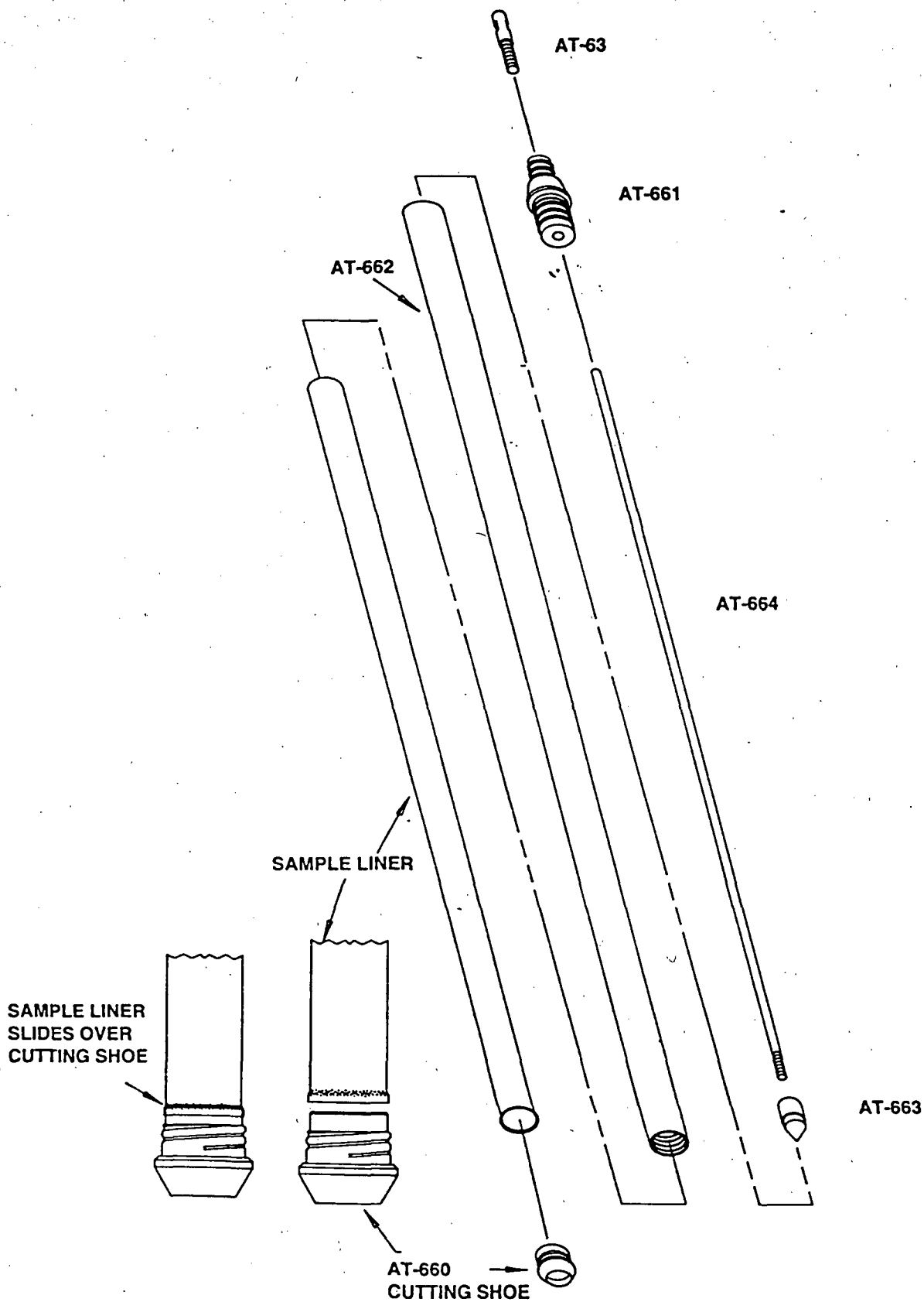


Figure 2. Large Bore Sampler Parts

4.2 Assembly

1. Install a new AT-63R O-ring into the O-ring groove on the AT-63 Stop-pin.
2. Seat the pre-flared end of the LB Liner (AT-665, -666, -667, or -668) over the interior end of the AT-660 Cutting Shoe. (Figure 3.) It should fit snugly.
3. Insert the liner into either end of the AT-662 Sample Tube and screw the cutting shoe and liner into place. If excessive resistance is encountered during this task, it may be necessary to use the AT-669 LB Shoe Wrench. Place the wrench on the ground and position the sampler assembly with the shoe end down so that the recessed notch on the cutting shoe aligns with the pin in the socket of the wrench. (Figure 4.) Push down on the sample tube while turning it, until the cutting shoe is threaded tightly into place.
4. Screw the AT-664 Piston Rod into the AT-663 Piston Tip. Insert the piston tip and rod into the sample tube from the end opposite the cutting shoe. Push and rotate the rod until the tip is seated completely into the cutting shoe.
5. Screw the AT-661 Drive Head onto the top end of the sample tube, aligning the piston rod through the center bore.
6. Screw the reverse-threaded AT-63 Stop-pin into the top of the drive head and turn it counter-clockwise with a 3/8-inch wrench until tight. Hold the drive head in place with a 1-inch or adjustable wrench while completing this task to assure that the drive head stays completely seated. The assembly is now complete.

4.3 Pilot Hole

A pilot hole is appropriate when the surface to be penetrated contains gravel, asphalt, hard sands, or rubble. Pre-probing can prevent unnecessary wear on the sampling tools. A Large Bore Pre-Probe (AT-146B) may be used for this purpose. The pilot hole should be made only to a depth above the sampling interval. Where surface pavements are present, a hole may be drilled with the Geoprobe using a Drill Steel (AT-32, -33, -34, or -35, depending upon the thickness of the pavement), tipped with a 1.5-inch diameter Carbide Drill Bit (AT-36) prior to probing. For pavements in excess of 6 inches, the use of compressed air to remove cuttings is recommended.

4.4 Driving

1. Attach an AT-106B 1-foot Probe Rod to the assembled sampler and an AT-11B Drive Cap to the probe rod. Position the assembly for driving into the subsurface.
2. Drive the assembly into the subsurface until the drive head of the LB sample tube is just above the ground surface.
3. Remove the drive cap and the 1-foot probe rod. Secure the drive head with a 1-inch or adjustable wrench and re-tighten the stop-pin with a 3/8-inch wrench. (Figure 5.)

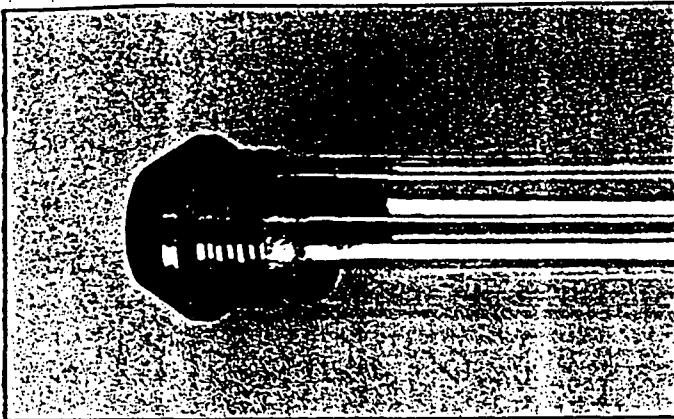


Figure 3. Liner fits snugly over interior end of cutting shoe.

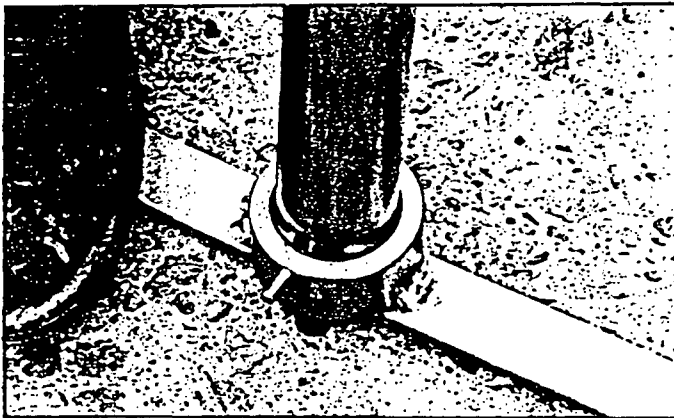


Figure 4. Using the AT-669 Cutting Shoe Wrench to attach cutting shoe.

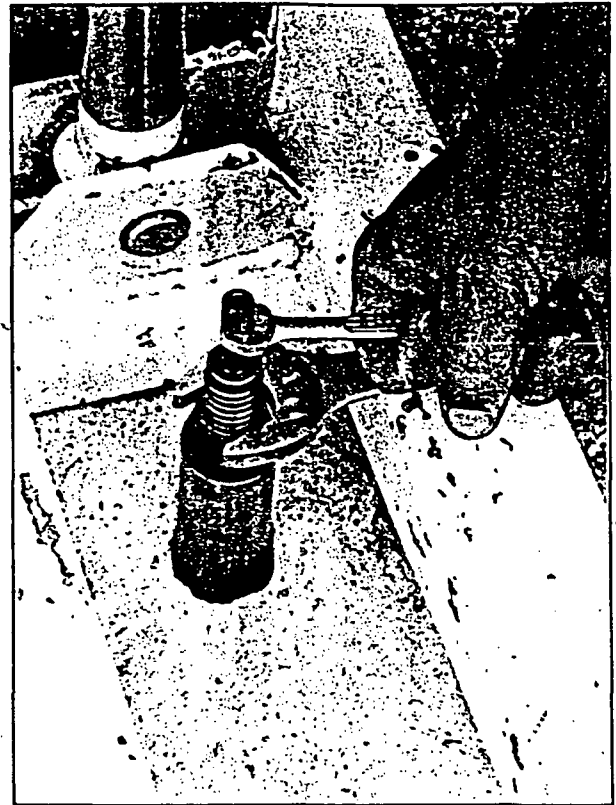


Figure 5. Tightening the Stop-pin.

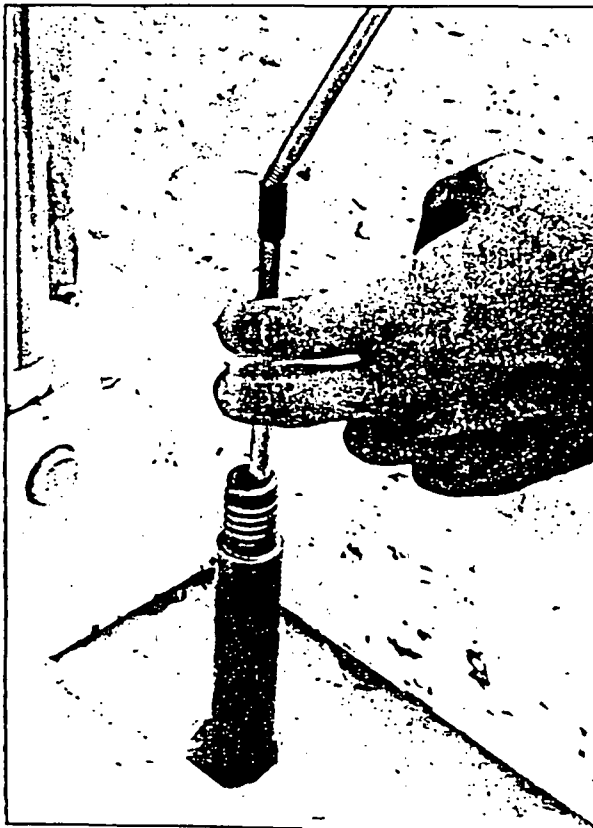


Figure 6. Coupling Extension Rods together.

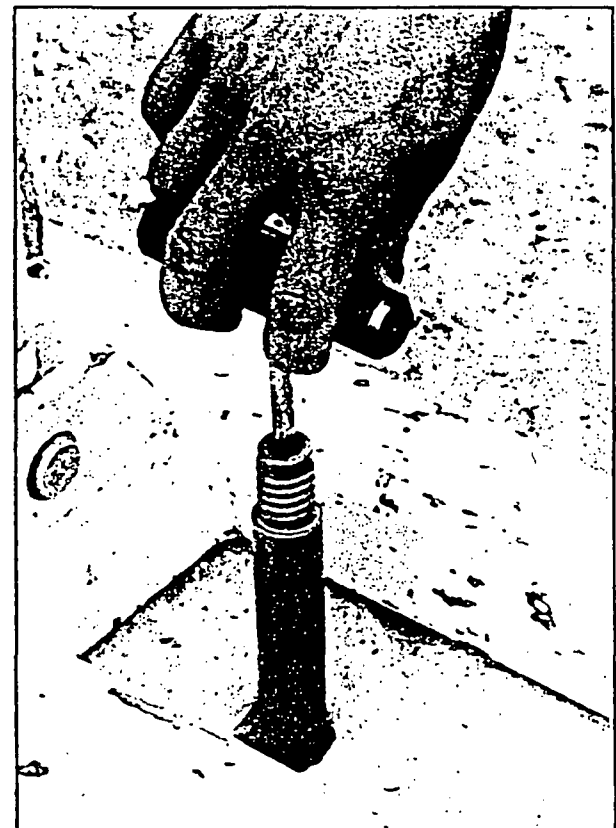


Figure 7. Rotating the Extension Rod Handle.

4.4 Driving (continued from page 5)

4. Attach an AT-105B 2-foot Probe Rod and a drive cap, and continue to drive the sampler into the ground. Attach AT-10B 3-foot Probe Rods in succession until the leading end of the sampler reaches the top of the desired sampling interval.

4.5 Preparing to Sample

1. When sampling depth has been reached, position the Geoprobe machine away from the top of the probe rod to allow room to work.

2. Insert an AT-67 Extension Rod down the inside diameter of the probe rods. Hold onto it and place an AT-68 Extension Rod Coupler on the top threads of the extension rod (the down-hole end of the leading extension rod should remain uncovered). Attach another extension rod to the coupler and lower the jointed rods down-hole. (Figure 6.)

3. Couple additional extension rods together in the same fashion as in Step 2. Use the same number of extension rods as there are probe rods in the ground. The leading extension rod must reach the stop-pin at the top of the sampler assembly. When coupling extension rods together, you may opt to use the GW-469 Extension Rod Jig to hold the down-hole extension rods while adding additional rods.

4. When the leading extension rod has reached the stop-pin down-hole, attach the AT-69 Extension Rod Handle to the top extension rod.

5. Turn the handle clockwise (right-handed) until the stop-pin detaches from the threads on the drive head. (Figure 7.) Pull up lightly on the extension rods during this procedure to check thread engagement.

6. Remove the extension rods and uncouple the sections as each joint is pulled from the hole. The Extension Rod Jig may be used to hold the rod couplers in place as the top extension rods are removed.

7. The stop-pin should be attached to the bottom of the last extension rod upon removal. Inspect it for damage. Once the stop-pin has been removed, the sampler is ready to be re-driven to collect a sample.

4.6 Sample Collection

1. Reposition the Geoprobe machine over the probe rods, adding an additional probe rod to the tool string if necessary. Make a mark on the probe rod 24 inches above the ground surface (this is the distance the tool string will be advanced).

2. Attach a drive cap to the probe rod and drive the tool string and sampler another 24 inches. Use of the Geoprobe's hammer function during sample collection may increase the sample recovery in certain formations. Do not over-drive the sampler.

4.7 Retrieval

1. Remove the drive cap on the top probe rod and attach an AT-12B Pull Cap. Lower the probe shell and close the hammer latch over the pull cap.
2. With the Geoprobe foot firmly on the ground, pull the tool string out of the hole. Stop when the top (drive head) of the sampler is about 12 inches above the ground surface.
3. Because the piston tip and rod have been displaced inside the sample tube, the piston rod now extends into the 2-foot probe rod section. In loose soils, the 2-foot probe rod and sampler may be recovered as one piece by using the foot control to lift the sampler the remaining distance out of the hole.
4. If excessive resistance is encountered while attempting to lift the sampler and probe rod out of the hole using the foot control, unscrew the drive head from the sampler and remove it with the probe rod, the piston rod, and the piston tip. Replace the drive head onto the sampler and attach a pull cap to it. Lower the probe shell and close the hammer latch over the pull cap and pull the sampler the remaining distance out of the hole with the probe machine foot firmly on the ground.

4.8 Sample Recovery

1. Detach the 2-foot probe rod if it has not been done previously.
2. Unscrew the cutting shoe using the AT-669 LB Cutting Shoe Wrench, if necessary. Pull the cutting shoe out with the liner attached. (Figure 8.) If the liner doesn't slide out readily with the cutting shoe, take off the drive head and push down on the side wall of the liner. The liner and sample should slide out easily.

4.9 Core Liner Capping

1. The ends of the liners can be capped off using the AT-641 Vinyl End Cap for further storage or transportation. A black end cap should be used at the bottom (down end) of the sample core and a red end cap at the top (up end) of the core.
2. On brass, stainless steel, and teflon liners, cover the end of the sample tube with AT-640T Teflon Tape before placing the end caps on the liner. (Figure 9.) The tape should be smoothed out and pressed over the end of the soil core so as to minimize headspace. However, care should be taken not to stretch and, therefore, thin the teflon tape.

4.10 Sample Removal

1. Large Bore Clear Plastic and Teflon Liners can be slit open easily with a utility knife for the samples to be analyzed or placed in appropriate containers.
2. Large Bore Brass and Stainless Steel liners separate into four 6-inch sections. The AT-659K Large Bore Manual Extruder may be used to push the soil cores out of the liner sections for analysis or for transfer to other containers. (Figure 10.)

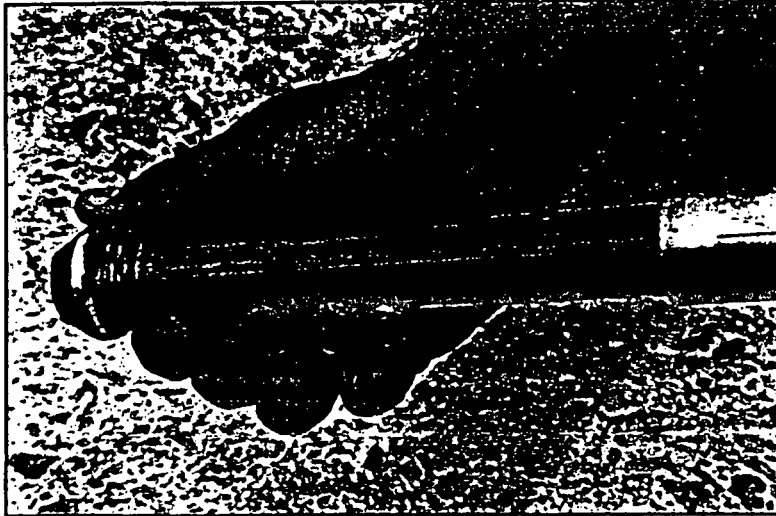


Figure 8. Removing the liner to recover the Sample.

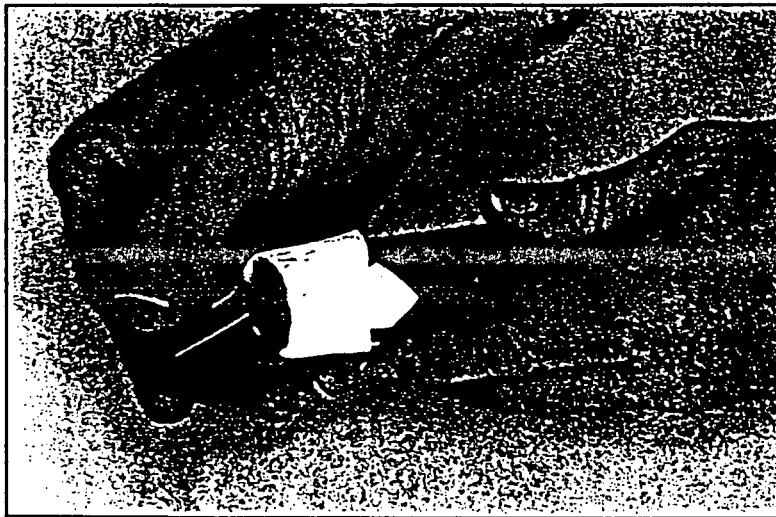


Figure 9. Covering the liner end with Teflon tape for capping.

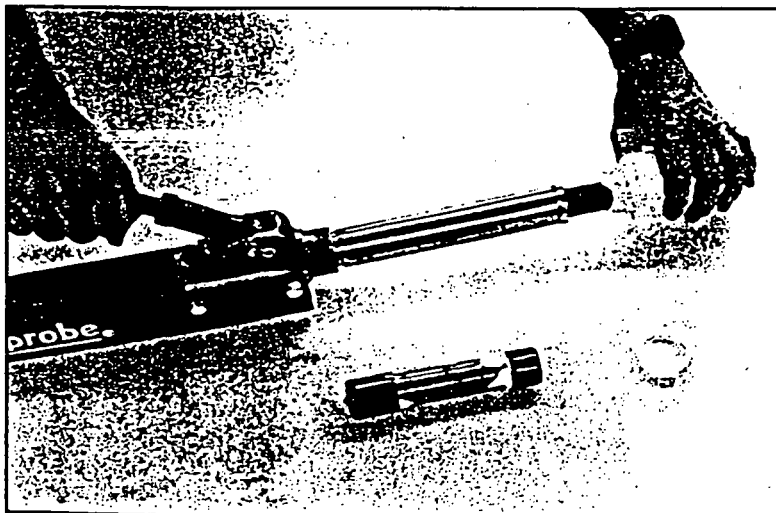


Figure 10. Extruding a sample in a metal liner using the AT-659K manual extruder.

5.0 REFERENCES

Geoprobe Systems, August 1993, "1993-94 Equipment and Tools Catalog".



Appendix C

APPENDIX C

FIELD VAPOR DETECTOR OPERATION PROCEDURES

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CALIBRATION PROCEDURE FOR THE HNU PI 101

1.0 INTRODUCTION

1.1 Content

This procedure presents the steps required to calibrate the HNU Model PI 101 photoionization analyzer. This instrument should be calibrated after each field use or prior to each field use if the instrument has not been calibrated during the previous 14 calendar days. The principle of detection and operating procedures are described in Procedure 5607001. This procedure presents calibration steps only.

1.2 Equipment

- o Calibration Gas (2 ranges)

Low range 0-20 ppm and mid range 20-200 ppm Isobutylene gas for standard field operation when contaminants are unknown or a mixture of gases is present. Isobutylene is the gas used for general calibration because of the instrument's relatively high sensitivity to it and the non-toxic nature of the gas.

Note: A specialty gas may be required if a single atmospheric contaminant is present and the contaminant has a sensitivity different from that of the calibration gas. See procedure for 5607001 for a discussion on specialty calibration.

- o Tubing and fittings (See Figure 1).
- o Rotameter or bubble flow meter.
- o Calibration Form F6264.
- o Table 1 for ionization potentials for compounds of interest.

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TABLE 1 RELATIVE SENSITIVITIES FOR VARIOUS GASES
(10.2 eV Lamp)

Species	Photoionization Sensitivity*
p-xylene	11.4
m-xylene	11.2
benzene	10.0 (reference standard)
toluene	10.0
diethyl sulfide	10.0
diethyl amine	9.9
styrene	9.7
trichloroethylene	8.9
carbon disulfide	7.1
isobutylene	7.0
acetone	6.3
tetrahydrofuran	6.0
methyl ethyl ketone	5.7
methyl isobutyl ketone	5.7
cyclohexanone	5.1
naptha (85% aromatics)	5.0
vinyl chloride	5.0
methyl isocyanate	4.5
iodine	4.5
methyl mercaptan	4.3
dimethyl sulfide	4.3
allyl alcohol	4.2
propylene	4.0
mineral spirits	4.0
2,3-dichloropropene	4.0
cyclohexene	3.4
crotonaldehyde	3.1
acrolein	3.1
pyridine	3.0
hydrogen sulfide	2.8
ethylene dibromide	2.7
n-octane	2.5
acetaldehyde oxime	2.3
hexane	2.2
phosphine	2.0
heptane	1.7
allyl chloride (3-chloropropene)	1.5
ethylene	1.0
ethylene oxide	1.0
acetic anhydride	1.0
α -pinene	0.7
dibromochloropropane	0.7
epichlorohydrin	0.7
nitric oxide	0.6

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2.0 CALIBRATION PROCEDURE

- 2.1 CDM employs a two-point standardization procedure to facilitate proper instrument calibration over the 0-20 ppm and 20-200 ppm operating ranges. Two distinct mixtures of the calibration gas (isobutylene) in air are used. Each mixture should give a 3/4 scale deflection in its respective operating range.
- 2.2 Instrument Setup.
 - 2.2.1 Remove Instrument cover by pulling up on the side straps.
 - 2.2.2 Prior to calibration, check the function switch (Figure 2) on the control panel to make sure it is in the OFF-position. The probe nozzle, is stored inside the instrument cover. Remove cover plate by pulling up on the pins that fasten the cover plate.
 - 2.2.3 Remove the nozzle from the cover. Assemble probe by screwing nozzle into casing.
 - 2.2.4 Attach probe cable to instrument box by inserting 12 pin interface connector of the probe cable into the connector on the instrument panel. Match the alignment keys and insert connector. Turn connector in clockwise direction until a distinct snap and lock is felt.
 - 2.2.5 Turn the function switch to the Battery Check position. When the battery is charged, the needle should read within or above the green battery arc on the scale plate. If the needle is below the green arc or the red LED light

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comes on, the instrument should be recharged prior to making any measurements. Implement step 3.0 to recharge battery.

- 2.2.6 Turn the function switch to the ON position. In this position, the UV light source should be on. To verify, gaze at the end of the probe for a purple glow. Do not look directly at the lamp itself. If the lamp does not come on refer to maintenance step 4.1.2.
- 2.2.7 To zero the instrument, turn the function switch to the standby position and rotate the zero potentiometer until the meter reads zero. Clockwise rotation of the zero potentiometer produces an upscale deflection while counter clockwise rotation yields a downscale deflection. (Note: no zero gas is needed since this is an electronic zero adjustment.) If the span adjustment is changed during instrument calibration, the zero should be rechecked and adjusted. If necessary wait 15 to 20 seconds to ensure that the zero reading is stable. Readjust as necessary.

2.3 Calibration Steps

- 2.3.1 Insert one end of T tube (Figure 1) into probe. Insert second end of probe into calibration gas in the 20-200 ppm range. The third end of probe should have the rotometer (bubbler) attached.
- 2.3.2 Set the function switch in the 0-200 ppm range.

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2.3.9 Complete forms F6264 and F6265 for the respective instrument being calibrated.

3.0 BATTERY RECHARGING

3.1 Place plug on end of charger cable into jack on left side of instrument case

3.2 Plug charger into 120V AC supply.

3.3 To ensure that charger is functioning, turn the function switch to the battery check position. The meter should go upscale if the charger is working correctly and correctly inserted.

3.4 The battery is completely charged overnight (ca, 14 hours).

3.5 When disconnecting charger, remove from 120 V AC before removing mini phone plug.

4.0 TROUBLE SHOOTING AND MAINTENANCE

4.1 General Fault Determination and Correction

4.1.1 Battery level is low. Recharge if necessary implementing step 3.0. If the battery will not recharge it will have to be replaced.

4.1.2 UV lamp function. Gaze at sample inlet when mode switch is on an instrument function position and observe for purple glow of lamp. If the lamp does not glow in any of the three instrument function positions, it may be burned out and will have to be replaced. To replace the lamp:

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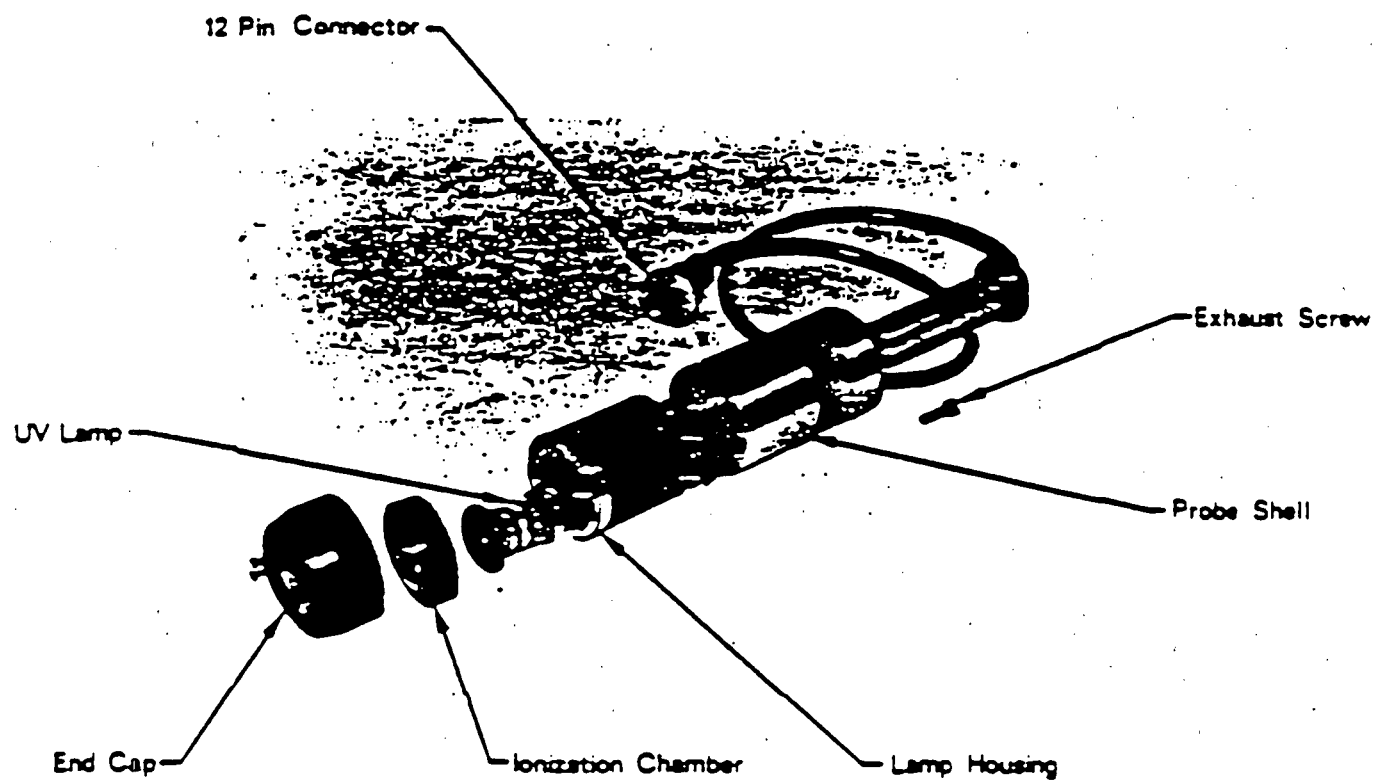


FIGURE 3 COMPONENT PARTS OF PROBE

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1. Power supply defective: Check power supply voltages per Figure 4. If any voltage is out of specification, consult the factory.
2. Input transistor or amplifier has failed: Rotate zero control; meter should deflect up/down as control is turned. Open probe; both transistors should be fully seated in sockets.
3. Input signal connection broken in probe or readout: Check input connector on printed circuit board. Should be firmly pressed down. Check components on back side of printed circuit board. All connections should be solid, and no wires should touch any other object. Check all wires in readout for solid connections.

4.2.3 Instrument responds correctly in BATT CHK, and STBY, but not in measuring mode.

1. Check to see the light source is on (See Section 4.1.2).
2. Check high voltage power supply (see Figure 4).
3. Open end of probe, remove lamp and check high voltage on lamp contact ring.
4. If high voltage is present at all above points, light source has most likely failed. Consult the factory.

4.2.4 Instrument responds correctly in all positions, but signal is lower than expected.

1. Check span setting for correct value.
2. Clean window of light source (See 4.1.3).
3. Double check preparation of standards.
4. Check power supply 180 V output. See Figure 4.
5. Check for proper fan operation. Check fan voltage. See Figure 4.
6. Rotate span setting. Response should change if span pot is working properly.

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4.2.5 Instrument responds in all switch positions, but is noisy (erratic meter movement).

1. Open circuit in feedback circuit. Consult the factory.
2. Open circuit in cable shield or probe shield. Consult the factory.

4.2.6 Instrument response is slow and/or irreproducible.

1. Fan operating improperly. Check fan voltage. See Figure 4.
2. Check calibration and operation.

4.2.7 Low battery indicator.

1. Indicator comes on if battery charge is low.
2. Indicator also comes on if ionization voltage is too high.

TABLE 1 - RESPONSE OF OVA TO HYDROCARBONS RELATIVE TO METHANE

Compound	Relative Response (%)
Methane	100 (Reference)
Propane	64
N-butane	61
N-pentane	100
Ethylene	85
Acetylene	200
Benzene	150
Tolvene	120
Ethane	90
Acetone	60
Methyl Ethyl Ketone	80
Methyl Isobutyl Ketone	100
Methyl Alcohol	15
Ethyl Alcohol	25
Isopropyl Alcohol	65
Carbon Tetrachloride	10
Chloroform	65
Trichloroethylene	70
Vinyl chloride	35

2.2 Methane Calibration

2.2.1 Equipment

- o Calibration gas (100 ppm methane)
- o T-tube assembly

2.2.2 Instrument Startup

Start instrument by:

1. Move PUMP switch to ON and check battery condition by moving the INSTR switch to the BATT position.

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7. Close methane gas cylinder. Turn off H₂ SUPPLY VALVE to put out flame. Wait for flameout alarm to sound to ensure the flame is out.
8. Leave CALIBRATE switch on the X10 position and use CALIBRATE ADJUST (zero) knob to adjust meter reading to 4 ppm.
9. Place CALIBRATE switch in X1 position and, using trimpot R-31 on circuit board, adjust meter reading to 4 ppm. This is the Bias Adjustment for the X1 range.
10. Move CALIBRATE switch to X10 position again. Use CALIBRATE ADJUST (zero) knob to adjust meter to a reading of 40 ppm.
11. Move CALIBRATE switch to X100 position and use trimpot R-33 on circuit board to adjust meter reading to 40 ppm.
12. Move CALIBRATE switch to X10 position and use CALIBRATE ADJUST (zero) knob to adjust meter reading to zero.
13. Unit is now balanced from range to range, calibrated to methane, and ready to be placed in normal service.
14. Shut instrument down by ensuring that the H₂ SUPPLY VALVE and H₂ TANK VALVE are closed and the INSTR and PUMP switches are in the OFF position.
15. Record on instrument calibration label, calibration date, gas, and initials of person performing calibration. Remove old tag and replace it with updated label. Fill out instrument history log form.

2.3 Calibration to Specialty Gas/Vapor

Primary calibration of the instrument is accomplished using a known mixture of a specific gas or vapor.

2.3.1 Equipment

- o Calibration (span) gas (75-90ppm of known gas or vapor)
- o T-tube assembly

tag and replace it with updated label. Fill out instrument history log.

3.0 FILLING OF HYDROGEN SUPPLY

The instrument should be completely shut down for hydrogen tank refilling. The refilling should be done in a ventilated area. There should be no potential ignitors or flame in the area.

1. Attach filling hose to external source of hydrogen. Pure hydrogen of 1,600 to 2,300 psi will be required.
2. Crack open valve on hydrogen supply, place FILL/BLEED valve on hose in FILL position and purge hose for 2-3 seconds.
3. Close FILL/BLEED Valve (OFF position) and immediately attach other end of fill hose to instrument fill connection and tighten the connection.
4. Open supply valve external on hydrogen tank 1/2 to 1 turn. Set regulator to 1,600 to 2,300 psi.
5. Open the REFILL Valve and the H₂ Tank VALVE on the instrument.
6. Place FILL/BLEED Valve in FILL position. The instrument hydrogen tank should now be filling.
7. The instrument H₂ Pressure Indicator should now indicate instrument tank pressure. This pressure should approximate that of the external supply tank regulator gauge.
8. After the instrument tank is filled, shut off:
 - a. The REFILL VALVE on the instrument panel.
 - b. The FILL/BLEED Valve on the filling hose assembly.
 - c. The valve on the external hydrogen supply bottle.
9. The supply hose and internal lines on the instrument now contain hydrogen under pressure. To reduce this pressure to atmospheric pressure:
 - a. Turn FILL/BLEED Valve to BLEED position until gas can no longer be heard escaping.

5.0 MAINTENANCE

5.1 General

Section 6.0 of the Model OVA-128 Instruction and Service Manual contains detailed maintenance and repair procedures for servicing the OVA. These procedures are not repeated here. Equipment managers are referred to the manual for repair of the OVA.

Equipment managers should be thoroughly familiar with instrument operation before performing maintenance. It is essential that all safety considerations regarding use and maintenance of this instrument be understood. There should be no potential igniters or flame in the area when filling, emptying, or purging the hydrogen system and the instrument should be in shut-down mode.

5.2 Trouble Shooting

Table 2 presents common problems and corrective actions for repairing the instrument.

6.0 REFERENCE

Foxboro Analytical. No date. Instruction and Service Manual, Century Systems Portable Organic Vapor Analyzer Model OVA-128 (M1 2R900AC).

D

Appendix
D

APPENDIX D

GENERAL FIELD SAMPLING PROCEDURES

GENERAL SOIL SAMPLING PROCEDURES

1.0 INTRODUCTION

Soil sampling is undertaken at uncontrolled hazardous waste sites and controlled substances work areas to determine the type, degree and extent of contamination resulting from previous disposal practices.

For the purposes of this document, soil is considered to be all unconsolidated materials above bedrock. Consolidated materials such as bedrock or rock outcrops are not considered soil, but may be encountered in soil borings. The procedures for rock sampling are described in document 5618003.

Soil materials which are submerged or exist beneath standing water such as in ponds or streams are considered sediments and specific procedures for obtaining sediment samples are described in Procedure 5614005.

Soils may have variable characteristics depending upon their texture, structure and moisture content. The selection of optimum sampling techniques and equipment to be used for soils will be dependent on the condition of the soil and the amount of material required for analysis. A major differentiating factor in the selection of techniques and equipment is whether surface or subsurface sample will be obtained. Surface samples are generally easy to obtain using hand equipment, as described in Procedure 5614002. Subsurface samples are obtained by advancing borings as described in Procedure 5614004. When a more detailed description of the shallow soil conditions are desired, excavation of test pits may be required, as described in Procedure 5614003.

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The log must be completed as a supplement to the data to be recorded in site field notebooks as described in Procedure 5621004. In addition, the log shall contain a detailed description of the soil encountered at the site during the sampling events. This detailed description includes:

- o Horizonation
- o Color utilizing Munsell Color Notation
- o Texture using USDA or unified classification system*
- o Density (standard penetration) or consistency
- o Odor**
- o Relative moisture content

4.0 EQUIPMENT CLEANING

In order to minimize the chances of cross contamination of samples, all sampling equipment must be carefully cleaned after obtaining each sampling. Sample containers shall also be cleaned prior to use as described in Procedure 5622006.

Equipment cleaning is undertaken in a manner which minimizes contamination of sampling sites, boreholes or monitoring wells. All wash waters and waste products generated during cleaning operations are placed in a 55-gallon drum for final disposal.

Sampling equipment is brushed with a wire brush to remove soil particles. Samplers which have been in contact with oily samples shall be wiped with absorbent cloth and then with reagent grade methanol. Samplers which have not come in contact with oily substances shall be wiped with a dry cloth. The samplers are then washed with a warm detergent solution (Liquinox, Alconox), rinsed with tap water and distilled water, wiped dry or allowed to air dry.

Thin tube samplers, split spoons and other boring rig equipment which will enter the borehole are steam cleaned with approved water, rinsed with reagent-grade methanol, and allowed to air dry prior to use.

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materials which contain petroleum distillates. Caps for glass containers must be teflon lined.

Plastic containers made of high density linear polyethylene (LPE), PVC or teflon are to be used when materials will not be analyzed for organics content. Plastic containers are only used when the material to be sampled is known to be non-reactive with the sample container.

Screw caps of the same material from which the containers are fabricated are used.

Subsurface samples may be obtained at predetermined depths, at every change in lithology or continuously. Continuous sampling provides the most accurate record of subsurface conditions for interpretive purposes.

3.1 Split Spoons

Split spoons are devices used to obtain subsurface samples of up to 2.5 feet in length within hollow stem auger flights, cased borings, and mudded holes. The 1.75 to 2.5 in ID split spoon samplers are advanced into the undisturbed material beneath the bottom of the casing or borehole by use of weighted hammer and drill rod. The relationship between hammer weight, drop and blows required to advance the split spoon in 6-inch increments is an indication of density or consistency of subsurface soils. After the split spoon has been driven the prescribed depth, it is removed carefully to avoid loss of soil materials. In non-cohesive or saturated soils a nest shall be used to help retain the sample.

Following removal of the split spoon from the casing, it shall be detached from the drill rod and opened to allow for visual classification of the sample. When less than a 10-inch sample has been obtained, a second cleaned sampler shall be lowered into the hole and a second sample shall be obtained. The first sample collected, if any, shall be retained unless greater sample recovery is obtained during the subsequent sampling attempts. The entire sample (except the top several inches of possibly "disturbed" material) shall be retained.

Samples of cohesive clays or silts shall be wrapped in aluminum foil prior to storage in jars, to preserve as undisturbed a sample as possible.

the material being sampled is of a nature which would permit retention in the sampler.

Upon successful retrieval of a soil core it shall be described and recorded in the log book and any disturbed soil shall be removed from each end of the tube. Samples for volatile organic analysis must be extracted from the solids sample as soon after the sampler is withdrawn as possible. During transport to the sampling station, the tube should be capped with a non-reactive material. For other parameter, the Shelby tube shall be sealed by pouring three 1/4 inch layers of liquid wax such as Socony Vacuum Product 2300 in each end allowing the wax to solidify between each layer. The remaining space shall be filled to the end of the cylinder with Ottawa sand or other similar sand and allowed to settle and compact. Plastic caps shall be taped over the ends of the cylinder and then sealed by successively dipping the ends into liquid wax. The tube shall then be labeled. Care should be taken in handling to label the top and bottom of the tube.

SURFACE WATER SAMPLING GUIDELINES

1.0 OBJECTIVE

The objective of obtaining surface water samples is to determine the surface water quality entering, leaving or affected by the site. Surface water samples are considered environmental samples (containing low concentrations of contaminants) but accurately quantifying the contaminants present is of utmost importance. In order to obtain a representative sample, the hydraulics of the water course must be determined before sampling, so that the most representative sample can be obtained.

Either grab or composite samples may be collected. Grab samples are collected at one particular point, and time. Flow- or time-weighted composite samples are composed of more than one aliquot collected at various sampling sites and/or at different times. Because of the unknown safety risks, as well as the changes in chemical nature of the sample that may occur through compositing, samples containing hazardous materials at significant concentrations shall not be composited. Environmental samples containing low levels of toxics may be composited.

If it is necessary to wade into the water course to obtain a sample, the team member shall be careful not to disturb bottom sediments and shall enter the water course downstream of the sampling location. While in reality, it is difficult to prevent disturbance of the sediments, it is the responsibility of the team member to minimize the introduction of sediments into the sample. If necessary, the sampling technician shall wait for the sediments to settle before taking the sample.

3.0 SAMPLING METHODS

3.1 Pond Sampler

The pond or dip sampler (Figure 1) consists of a container attached to the end of a long pole by an adjustable clamp. The pole can be of any non-reactive material such as wood, plastic or metal, as it will not be in contact with the sample itself. The sample shall be collected in a jar or beaker made of stainless steel, glass or non-reactive plastic. Preferably, a disposable beaker which can be replaced, shall be used at each station. Liquid wastes from water courses, ponds, pits, lagoons or open vessels are "ladled" into a sample container.

3.2 Manual Hand Pumps

Manual pumps are available in various sizes and configurations. Manual hand pumps are commonly operated by peristaltic, bellows or diaphragm, and siphon action. Manual hand pumps which operate by a bellows or diaphragm, and siphon action should not be used to collect samples which will be analyzed for volatile organics.

The pump is operated according to manufacturer's instructions. The sample inlet hose is inserted into the liquid to be sampled, and a crank or bellows is activated.

To avoid contamination of the pump, a liquid trap consisting of a vacuum flask is inserted at the sample inlet hose to collect the sample (Figure 2). Teflon tubing shall be used for the inlet hose in order to avoid sample contamination. The hose and trap must be flushed between stations with a minimum of three volumes of liquid, and cleaned or replaced at the end of each day.

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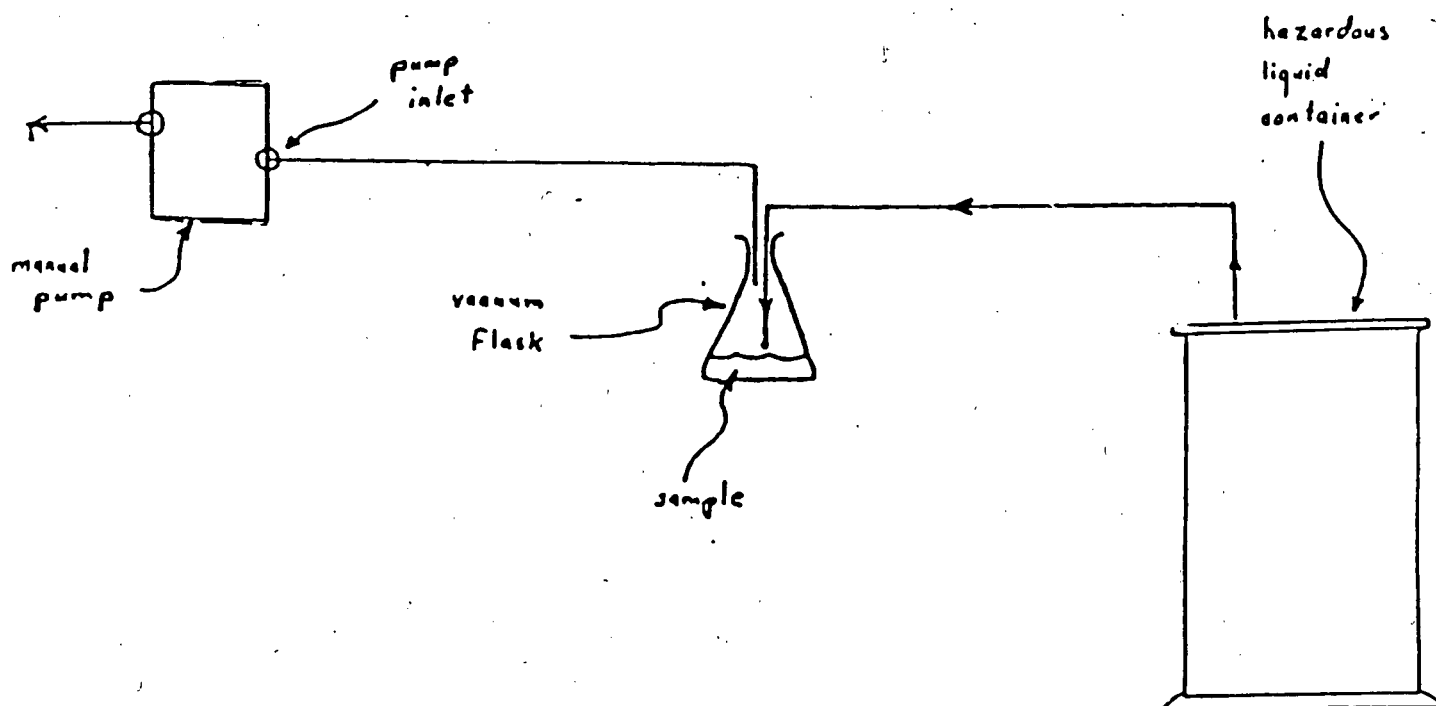
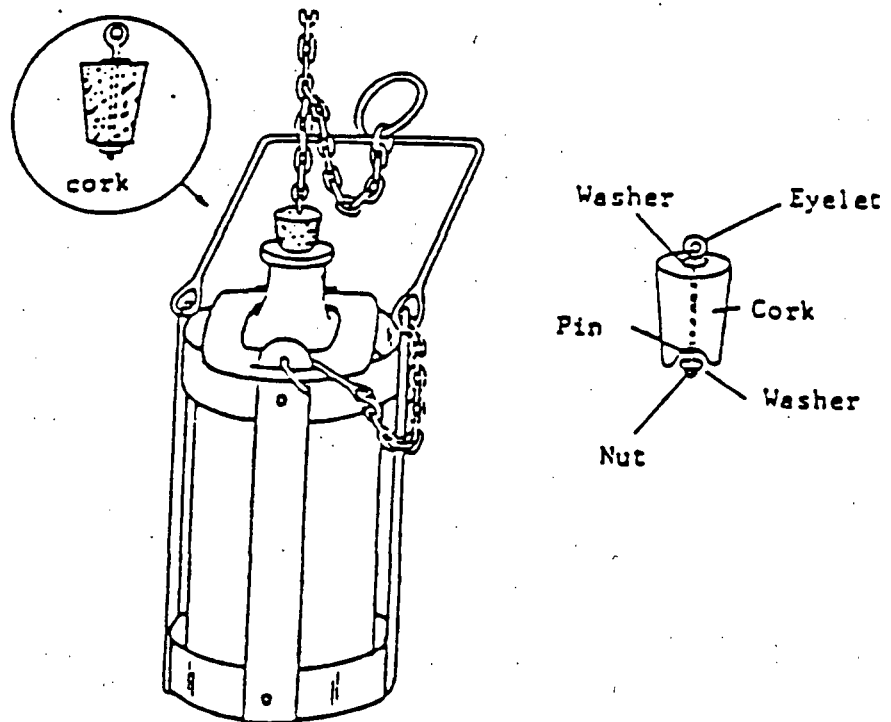


Figure 2

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1000-ml (1-quart) weighted
bottle catcher

Figure 3 Weighted bottle sampler.

SEDIMENT SAMPLING GENERAL CONSIDERATIONS

1.0 INTRODUCTION

Sediment samples are obtained at uncontrolled hazardous waste sites and controlled substances work areas in order to provide information on transport of contaminants. Sediments consist of soil materials which have been transported to ponds or streams due to surface soil erosion or those materials that occur naturally under submerged conditions. Sediments are generally saturated and may be composed of mineral or organic materials or a combination of these.

2.0 SAMPLING EQUIPMENT AND TECHNIQUE

Sediment samples may be obtained using on-shore or off-shore techniques. Sediment sampling equipment and techniques must be designed to minimize the risk of dilution or loss of material as the sample is moved through the water column. For these situations where flotation devices or boats are required for sampling, extra precautionary measures must be employed. At a minimum, life preservers must be provided and two individuals shall undertake the sampling and an additional person shall remain in visual contact on-shore to observe the operations.

In the following sections, sediment samplers and their use are described.

2.1 Dip Sampler

A dip sampler consists of a pole to which a jar or scoop is attached. The pole may be made of bamboo, wood or aluminum and

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Because core sleeves and nests are generally made of plastic, special provisions should be made if samples are to be tested for chlorinated organics.

The land operated core sampler will not be useful for obtaining samples of gravelly, stoney or consolidated sediments.

2.3 Gravity Core Samplers

Gravity core samplers are used to obtain sediment samples in water bodies or lagoons with depths of greater than 3 to 5 feet. These types of samplers can be used for collecting 1 to 2 foot cores, with a 2 inch ID, of surface sediments at depths of up to 100 feet beneath the water surface.

As with all core type samplers, they are not suitable for obtaining samples of coarse - gravelly, stoney, or consolidated desposits. They are however, useful for fine grained inorganic and organic sediment sampling.

The gravity core sampler operates in a manner similar to the hand operated core in that a plastic sleeve of 2 inch ID fits within a metal core housing fitted with a cutting edge. Plastic nests are used to retain the core within the plastic sleeve. An opening exists above the core sleeve to allow free flow of water into and through the core as it moves vertically downward to the sediment. The sampler has a messenger-activated valve assembly which seals the opening above the plastic sleeve following sediment penetration. This valve is activated by the messenger creating a partial vacuum to assist in sample retention during retrieval.

Samples are obtained by allowing the sampler which is attached to approximately 100 feet of aircraft cable to drop to the benthic



Appendix E

APPENDIX E

GENERAL DECONTAMINATION PROCEDURES

Procedure: 5621003

Revision: 0

Date: 3/85

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GENERAL DECONTAMINATION PROCEDURES

1.0 INTRODUCTION

In order to reduce risk of transfer of contaminants from areas of known contamination to known clean areas, decontamination of personnel and equipment is required. A description of site area contamination zones is presented in Procedure 5621001. The decontamination procedures shall be established for each site based on the degree of hazard associated with the site and the amount of contact with hazardous materials resulting from site work. Final decontamination procedures shall be reviewed and approved by the site Health and Safety Manager. This procedure contains only general decontamination protocols. Specific decontamination protocols are presented in the REM II Health and Safety Assurance Manual.

2.0 DECONTAMINATION GUIDELINES

2.1 Personnel and Equipment

Decontamination of personnel and equipment is accomplished by washing, and collection of washings and used equipment for treatment, prior to deposition in sealed drums. A general layout of a decontamination line is illustrated in Figure 1.

Decontamination procedures are designed to remove contaminated debris or liquids from protective equipment. Sufficient water and solutions will be available at each site to wash the materials from clothing. Typical decontamination solutions may consist of either 5 percent sodium carbonate (Na_2CO_3) and 5 percent trisodium phosphate (Na_3PO_4) 4 lbs each to 10 gallons of water or 10 percent calcium hypochlorite ($\text{Ca}(\text{ClO})_2$) 8 lbs to 10 gallons of water. Rinse solutions generally consist of 5 percent

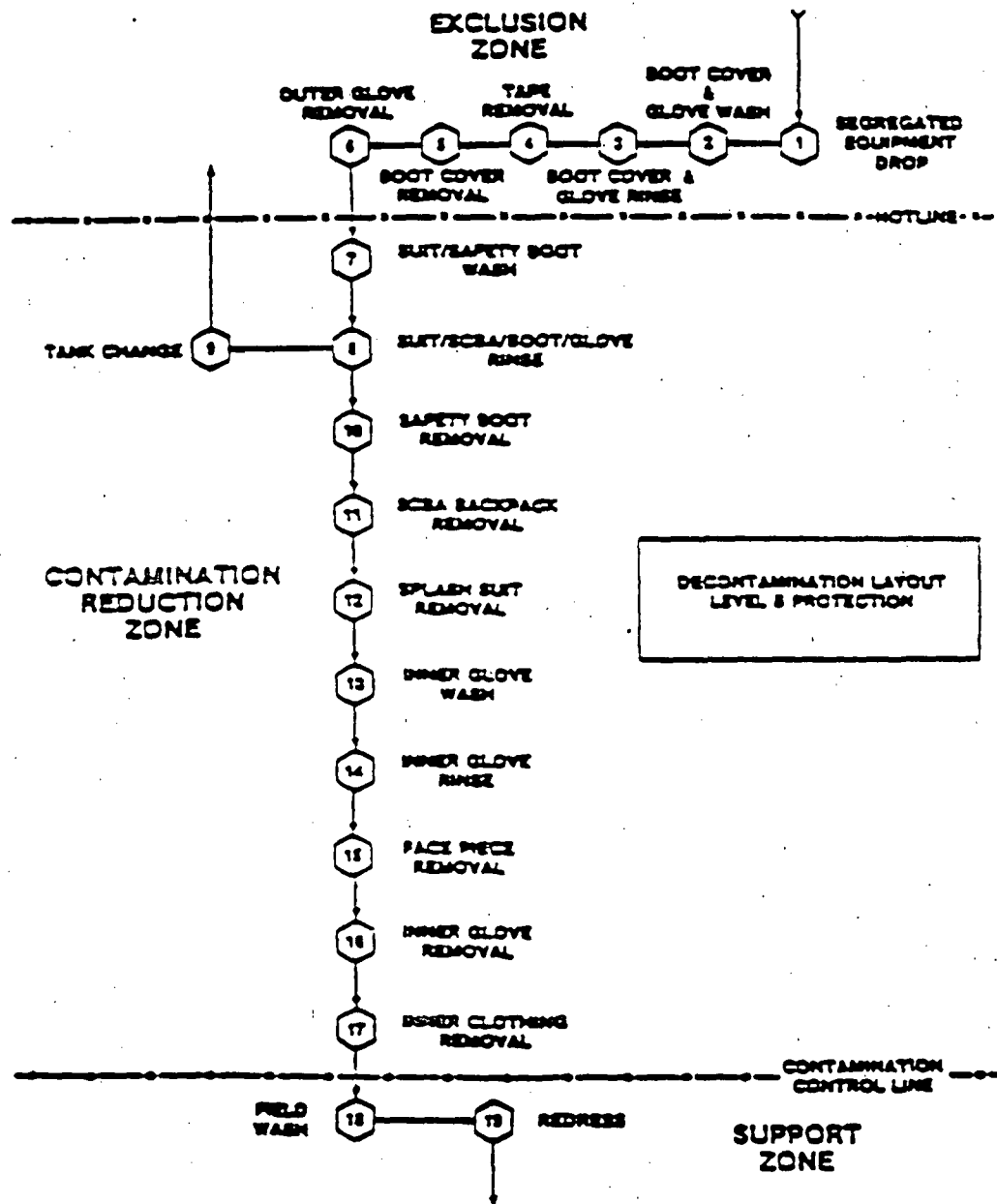


Figure 1 General Decontamination Layout

solutions of trisodium phosphate. Decontamination solutions of dilute HC may also be used when appropriate. The final rinse for all procedures is with clean water.

2.2 Decontaminated Garment Storage

Decontaminated outer garments are stored in a designated area within Zone II. Only those under garments which will be laundered or which do not need to be decontaminated in the decontamination line are brought into the trailer.

2.3 Emergency Decontamination

For emergency decontamination, an outdoor shower shall be located within Zone II and supplied with clean water under pressure. The shower will be located above a grate which allows for collection of all wash waters and a pump for transfer of the used water to properly marked drums for disposal on site.

2.4 Intermittent Work Sites

No decontamination will be required for outer protective clothing as it will be discarded. If equipment becomes contaminated, it should be properly stored and secured in the contaminated zone until a later time when it can be properly decontaminated.